

"GALACTICA
TV Spaceships (pg. 36)

Civilization In Space:
GERARD K. O'NEILL'S High Frontier

JULY 1978 #3

FUTURE

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Artist Boris Vallejo's visualization of humanity meeting its destiny. (pg. 66)



**Exclusive Interview: LARRY NIVEN
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The Magazine of Science Adventure

JULY 1978 #3

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On The Cover: Long known for his mastery of heroic, idealized human figures, artist Boris Vallejo (who simply signs, BORIS) has created an original painting which beautifully sums up the spiritual theme of FUTURE. Unusually abstract in concept, the scene depicts a space-age Adam and Eve inspired by the beauty and lure of the heavens, reaching literally toward the stars. The exclusive interview with Boris, discussing his life and works, accompanied by a portfolio of reproductions, begins on page 66. For the step-by-step story of how Boris designed and painted the cover, see the box within the main feature.

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By now, if you've been reading FUTURE since the first issue, the theme of our new magazine is probably crystal clear. To some, however, it may seem like a hodge-podge of unrelated subjects.

For instance, just look at this issue: A survey of all the various science-fiction movies derived from the books of Jules Verne—an interview with famed SF novelist Larry Niven—advance photos of the spaceships designed for the new TV series *Galactica* (now retitled *Earth Star*)—and a preview of the new animated version of science fiction's most durable hero, Flash Gordon.

Surely, you may say, this is a magazine aimed at those interested in spaceships, swashbuckling adventure and inter-galactic heroes. But the magazine also contains an article on quasars, pulsars, and black holes—a look into designing and dealing with our possible futures, by author Frederik Pohl—the third chapter of our Civilization in Space series, featuring an interview with the high frontier's intellectual spokesman, Gerard K. O'Neill.

The fact is that FUTURE doesn't fall neatly into *any* established pigeonhole. On newsstands, we've found the magazine sitting next to *Scientific American*, *Famous Monsters*, *Newsweek*, *Popular Mechanics* and *Argosy*—to name just a few.

Nobody seems to know exactly where FUTURE belongs—except our readers.

They understand. They know what FUTURE is all about. They may not be able to verbalize the magazine's theme succinctly, but they can "feel" the attitude that runs throughout every page.

And it excites them—makes them feel more positive about life and about all the interesting things that are happening in the world. It puts the entertainment that they enjoy today into a more long-range perspective; it lets them look forward to tomorrow with greater knowledge. It informs and motivates and inspires—and perhaps best of all, it begins to bring into focus that inevitable crystal ball vision that every human being is heading towards—the future.

That's what we're about, but what are *you* about? What other magazines do you read? What is your career? What are your hobbies? Please *tell us* by completing the Reader Data form on page 8 of this issue. We read every letter that comes into our office, and the better we get to know you, the more we can give you the kind of FUTURE you want.

Kerry O'Quinn/Publisher

Because of the large volume of mail we receive, personal replies are impossible. Comments, questions and suggestions are appreciated, however, and those of general interest may be selected for publication in future issues. Write:

FUTURE
Input
475 Park Ave. South
8th floor suite
New York, NY 10016

FUTURE FAN

... I just finished devouring my first issue of FUTURE and it left a very pleasant taste in my mind. I hope future FUTUREs are equally appetizing.

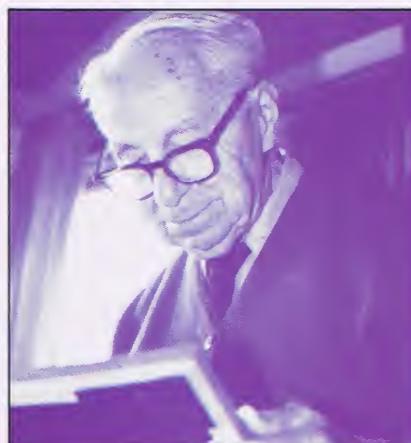
The feature on Chesley Bonestell was inspiring and your interview with Frederick Pohl enlightening.

One suggestion: if you intend to publish more articles on space art, it may be worth your while to take a look at some of the work of Robert McCall. He is largely unknown in fan circles and yet the calibre of his work is on a par with that of Mr. Bonestell's.

Looking forward to many years of FUTURE in my lifetime.

Terrence Bergh
Niles, Illinois

We agree with you on your opinion of McCall's work, Terrence. So much so, in fact, that we already have an article on this talented space artist in the works. Rest assured that McCall's planet portraits will grace the pages of a future FUTURE.



SPACE ARTISTS

... I have received your new magazine and was highly pleased with the total layout... most especially the stunningly beautiful Bonestell paintings. I always get that exciting sense of wonder when I see the master's artworks. It gives me great pleasure to know the visionaries such as Bonestell live to see their dreams come true. I hope that you will put out a special publication containing space art similar to your other two STARLOG Photo Guidebooks on Spaceships and Aliens.

Lim Young
3745 N. Teiman
Fresno, CA

We couldn't agree more. In fact, several months ago we started researching and collecting materials for just such a publication. It probably won't be ready until late summer, but you've forced us into a sneak preview. The book will contain biographical data on all the great space artists (including Bonestell, naturally) and most important, it will feature pages and pages of mind-boggling color space paintings. It will be well worth waiting for!

ARTISTICALLY INCLINED

... As one who has been a STARLOG fan since Issue #1, I am now a fan of FUTURE magazine. STARLOG was the first and is still the best slick SF magazine and FUTURE is twice as professional and twice as sophisticated.

I enjoyed your news magazine approach and the use of science and factual material. As an art lover, I especially liked the Bonestell article and look forward to articles on my very favorites Frank Frazetta and Frank R. Paul. Frazetta is a Hugo award winner and Frank R. Paul was the art director, cover artist and personal friend to Hugo Gernsback.

I would like to conclude by wishing FUTURE a long and prosperous future!

James Wilson
Park Ridge, Illinois

Thanks for the kind words, James. Give us time and we'll cover all of the artists who have contributed to the wondrous field of science fiction-science fact.

TRUMBULL BOOSTER

... Congratulations on your premiere issue! It was great! Also, I'd like to thank Douglas Trumbull for not only making the films we see better, but for working to give us a better way to view them. He encompasses the whole idea behind your magazine—the "future" today.

Eric Drumwright
Elmhurst, Ill.

IN SEARCH OF FRODO

... In the April issue of FUTURE, Christopher Slaughter asked how J.R.R. Tolkien came to write *The Lord Of The Rings*, and you replied that the epic was "entirely of his own making." This is not exactly correct. To quote Henry Resnik of *The Saturday Evening Post*: "Tolkien's long acquaintance with Norse and Germanic myths has inspired the chiller, more menacing landscapes of Middle Earth, and he makes no secret of having deliberately shaped two major interests of his life—rural England and the Northern myths—to his own literary purposes. In *The Lord Of The Rings*, Tolkien says, 'I have tried to modernize the myths and make them credible.'"

Much of the basic plot of *LOTR* derives from the "Siegfried the Dragon-Slayer" legends, which are found in the Icelandic *Eddas* and *Volsunga Saga* and the Germanic *Nibelungenlied*. Many of the names of dwar-

ves, elves, "Mirkwood," "Middle Earth," and even Gandalf and Frodo can be found in the Icelandic epics.

Tolkien follows in the tradition of men such as Malory, Gottfried von Strassburg and William Morris in taking myth and legend and reworking them into forms more accessible to contemporary readers. Tolkien's ability to recreate and elaborate on Northern mythology as magnificently as he has and to bring the wonder of ancient legends to a modern public is his genius as a fantasist.

T. Windling
Yellow Springs, Ohio

*Well said, although we do think you're selling Mr. Tolkien a bit short. Despite the fact that he borrowed heavily from mythological antecedents, Tolkien did invent an entire world populated with distinctive denizens and plot lines. We would no more deny Professor Tolkien the authorship of *The Lord Of The Rings* than we would Sir Thomas Malory's claim to *M'orte D'Arthur*, Homer's to *The Odyssey* or Milton's to *Paradise Lost* although all three authors freely used popularized mythos in structuring their works.*



ERA AN ERROR

... I must disagree with Harlan Ellison's opinion that science-fiction fans should support ERA. I don't support it. Oh, I'm all for equal pay and equal opportunity, but I don't think all women *should* get jobs. That would be a great restriction on the family. The family is the *most important* organization. I believe a father should work, earn money, and of course spend much time with his family. A mother should take care of her children. Don't send your kids to Day Care Centers unless you *have* to work. Some women don't want children because they want to pursue a career. If that's what they want—fine. We need competent women in many fields. The women who don't want children because they take up too much time are simply selfish. I hope I haven't offended anybody, but this issue is important to me. You see, without the family, there is no future.

Johnny Townsend
Metairie, La.

ERA OK

... A thousand cheers for Harlan Ellison! I was enormously pleased to see the article on his support of the Equal Rights Amendment in your magazine. I, too, agree that the most beautiful ideas are worthless unless we're willing to live them today, in the here and now. The ERA is not just for women, it's for everyone. And as someone once said, "The future is now!" I plan to bring this article to the attention of Ms. magazine. I know they will be very pleased and encouraged—as I was.

I hope that your magazine will continue to follow Mr. Ellison's recommendations. I must point out that in FUTURE #1, virtually everyone pictured or talked about was a white male. With the exception of Dr. Yin on page 31, women and those races which are in the minority in our country are highly conspicuous by their absence—note especially "Future Forum." Please take this criticism in the kind spirit in which it is offered. I will be looking forward to your next publication.

Janeen Sloan Kent
Gahanna, Ohio

NASA KNOWS

... Congratulations on your interesting and imaginative first issue of FUTURE.

FUTURE drives home the fact that we are already living in the space age. Unfortunately, it is difficult for most of us who have been raised on Buck Rogers to realize that man in space is now science fact and not science fiction. Even more important, your magazine helps to point out that space technology, even in these infant years, is already paying off handsomely in enhancing our lives here on planet Earth.

Good luck in the FUTURE!
Charles T. Hollinshead
Director, Public Affairs Office
John F. Kennedy Space Center
Kennedy Space Center, Florida

PROGRESS PAINS

... Responding to your Output in FUTURE #1: I went to Europe over Christmas and each way I was heartily cursing those neo-Luddites who axed the American SST and who squawk at the Concorde landing in American airports. The 747 is fine in its own way, but the trip to and from Europe takes too long—and after sitting for eight hours in the same tiny seat with the drone of the engines driving you batty, you're in no shape to do anything on arrival but be pointed to the nearest cot and bottle of aspirin. My venerable ancestors, who came to this country in sailing ships and steamships, on long voyages lasting weeks (and probably in steerage) would doubtless be nonplussed to hear me complain of making the trip in eight hours—but *their* complaints would have probably sounded ridiculous to the even earlier Viking colonists who might have even had to row over.

Dwight R. Decker
2109 North 74th Ave.
Elmwood Park, Ill. 60635

ALIEN ENCOUNTER

... Many kudos on your latest effort, *Science Fiction Aliens Guidebook*. Fine work, but with one slip-up: the synopsis of *The 27th Day*. This movie (one of my favorites, if you overlook the overtones of McCarthyism) did not end with only the Russians dying. Nay, kind sirs, it was *all* "haters of Democracy" that succumbed to the capsules. It is my opinion that no nation was left untouched.

Chris S. Rom
Sun Prairie, Wisc.



LOGAN VS. NEILSON

... Regarding Michael Smith's letter in your first issue (concerning the cancellation of *Logan's Run*), you didn't understand the logic of his statement "why should we allow 1,200 people to tell 75 million households what we should watch?"

He's referring to the Neilson rating system. This system makes those mysterious Ratings by which all programs live or die. There are 1,500 households selected by the Neilson Corporation. Their identities are kept carefully secret. A device is attached to monitor their TV sets to determine what they watch when, for how long, how often and to what they switch channels, etc.

The families are chosen by statistically determined percentages as to age, sex, job, number of children and their ages, and so forth. It is this small, selected group of people that determines the ratings which in turn determine all network programming. The term for it is demographics.

Christy Marx
Los Angeles, California

Thanks for the info, but if you reread the letter in FUTURE No. 1, it wasn't the statement concerning demographics that puzzled us, but the logic behind the letter.

databank

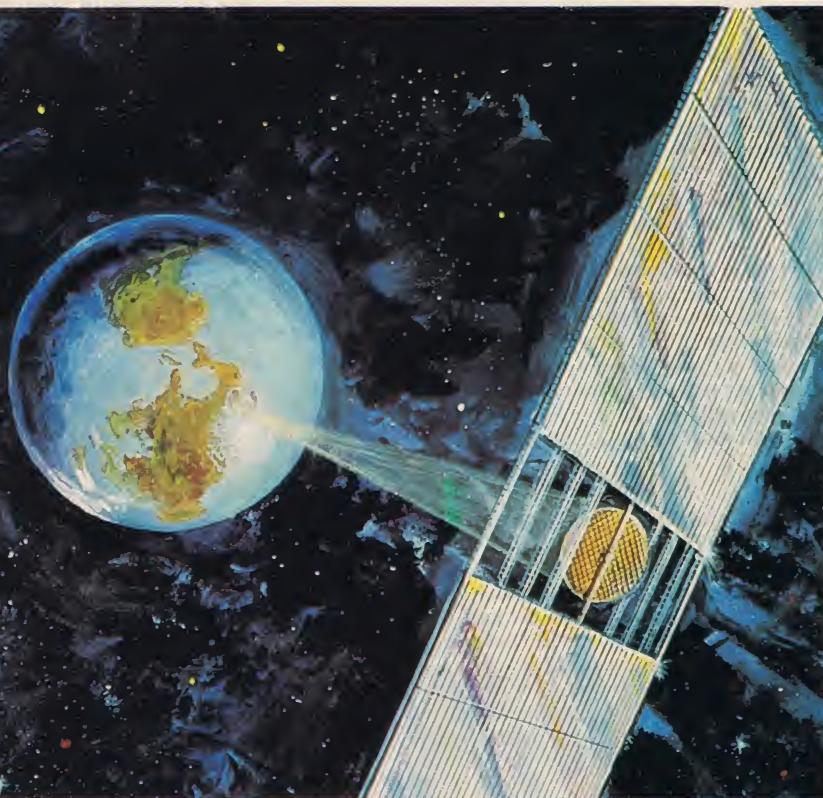


Photo: Grumman

ENERGY FROM SPACE?

When Dr. Peter Glaser first took his idea—building ten-mile long solar power stations in space to supply electricity for Earth—to NASA, he was greeted with general disbelief. That was 1968. Now ten years later, with some research under its belt, the space agency is more inclined to take solar power satellites seriously. But there are still plenty of questions to be answered (and research dollars to be spent) before NASA or anybody else can actually build a powersat.

Right now NASA spends a little more than two million dollars annually on paper studies of the concept, and the Department of Energy spends about the same. That may sound like a lot of money, until you stop to remember fusion power research gets about \$400 million a year. To date, government-funded powersat studies have proceeded at a leisurely pace.

Meanwhile, in Congress more and more time is spent worrying about energy matters these days, and powersats are stirring up interest as a long-term renewable energy alternative. A



EXPLORER'S TREK

Someone up there is watching Naomi Uemura. On March 4, the 37-year-old explorer from Tokyo set out alone on a dog sled en route to the North Pole. During the six-month, 3,725-mile venture, which originated from Ellemere Island in Canada's Northwest Territories, Uemura and his husky friends will not be alone. Their progress is being monitored by Nimbus 6, a NASA meteorological satellite.

The project was arranged in cooperation with the Smithsonian Institute in Washington and the National Geographic Society, though Uemura himself incurred all costs for the trip.

Daily, from 600 miles above the Earth, Nimbus 6 will receive a signal transmitted from a 10-pound, battery-powered beacon mounted to the dog sled. The beacon will transmit a radio signal once every minute; Nimbus 6

passes over the North Pole every 108 minutes. Data will be relayed to a NASA center in Fairbanks, Alaska, and then on to NASA's Goddard Center in Greenbelt, Maryland.

In addition, Uemura will take daily snow, ice and air samples to be used in studies by Japan's National Institute of Polar Research and the Water Research Institute of Nagoya University.

Uemura is no newcomer to such adventurous endeavors. He recently spent 18 months on a jaunt across Greenland (where he had lived among the native

TRACKED BY SATELLITE

Eskimos) to Alaska. His travels take him upward, as well, as he is an avid mountain climber.

Scientists hope that by watching Uemura's daily movements they can test the value of his dead-reckoning techniques, which are especially difficult to employ amid the vast emptiness of the polar regions.

Scientific considerations aside, Uemura has the elements to deal with, too. During his first week out and while still camped on Ellemere Island, Uemura and his canine companions were visited one cold night by a curious polar bear. Probably roused from a deep winter slumber and most likely hungry enough to eat a Well, the bear proceeded to devour all the dog food. While this certainly upset certain members of the expedition, considering the alternatives it could have been much worse.

recent bill introduced into the House of Representatives (H.R. 10601) by Alabama Rep. Ronnie Flippo would increase powersat funding to \$25 million by next fiscal year and establish a specific office within the Department of Energy to give more attention to powersat studies. NASA would be charged with developing a pilot plant to be tested in space.

"The technology to place solar power satellites in space is available now," Flippo said, "and it was paid for through the development of the space program."

So what exactly is a powersat? Peter Glaser's original concept called for a three-by-ten-mile array of photovoltaic cells (which convert the Sun's energy into electricity) to be built in geosynchronous orbit so it would always stay over the same point on Earth. The powersat would stay in sunlight 24 hours a day during most of the year and since there are no cloudy days in space, it could provide uninterrupted electricity. The electricity would be converted to microwave and beamed to a receiving antenna (or rectenna) on Earth, where it would be reconverted to electricity.

Since Glaser first proposed the idea, the concept has been studied by aerospace companies like Boeing, Grumman and Rockwell, and variations on the idea have been proposed. Instead of a photovoltaic array, some favor a solar thermal generator which would use mirrors to focus the Sun's energy on a steam generator to produce electricity. Others suggest that the best place for a nuclear power generator is off the planet, and powersat principles might be applied to import nuclear energy from space.

Glaser says one medium-size powersat, producing about 10 gigawatts of electricity, would meet the needs of New York City by 1990. By mid-21st century, 112 such satellites could supply half the world's electricity requirements.

As for now, the whole program needs a federal funding boost to get it off the ground. When more of the technical, environmental and economic questions are answered, NASA will be on the way to harnessing the Sun's energy in space for planetary consumers. ■



KILLER TREES TO EAT FLORIDA

The Army Corps of Engineers is writing a new chapter in the valiant defense of our country against foreign invaders. Except this war, while terrestrial, involves elements of future-shock science fiction. The battleground is southern Florida and the Engineers are up against legions of invaders who are reportedly squeezing out all the natural vegetation in the habitat, driving away wildlife, and slowly drinking the Everglades *dry*.

The evil monster even comes complete with a mild-mannered disguise; it is called the melaleuca, but it is known locally as the Punk Tree. Brought into this country from Australia in 1906, the Punk (or cajeput) Tree is a highly tenacious plant that grows in wet or dry land, seeds profusely, and has an incredibly high resistance to disease, insects, and even fire. Short of calling in F-14 Fighter planes, or deep-frying the state of Florida in the juice from 50,000 megawatts of electricity, there seems to be no known way to destroy the Punk. And it is multiplying fast.

It grows in any kind of soil, wet or dry, swamp or pasture. Silently expanding their territory, the Punks flower—incredibly—between two and five times annually, producing millions of seeds the size of grains of pepper. These seeds are easily air-borne, or can happily proliferate in an albumen of water. So far, not so strange. But the melaleuca, after damage by cold weather, cutting, or even fire, is stimulated to produce even more seeds, and refuses to die. When other plants or trees are killed by fire, the melaleuca thrives and multiplies.

Many people in Florida believe that the melaleuca is destroying the natural environment. They claim its dense growth chokes out native vegetation, and it doesn't even produce seeds or fruits for wildlife to eat. The frequent flowering of the Punk also causes extreme allergic reactions in some humans. And, to make matters even more alarming, the Punk is an extremely *thirsty* critter. It uses up water much faster than natural or desirable

vegetation does, thus helping to choke off the life of a plant or tree that might be useful to somebody.

Controlling the growth of the Punk is no easy task, but the Army Engineers are optimistic. "We're looking now at two chemicals that will cause the tree to die in dry soil conditions, by interfering with the process of photosynthesis. But we're not saying that this is the answer. Until these chemicals were found to affect the melaleuca, we had nothing to stop that tree," says Anthony Rekas, the biologist who manages the melaleuca control program for the Army.



Who is responsible for the introduction of the Punk? Well, it seems that the Army Engineers have a bit of egg, or *spore* if you will, on their faces. It seems that back in the 1940s, the Army introduced the melaleuca to the Lake Okeechobee levee system to protect it from high waves caused by storms. At the time, it seemed like a good idea: the Punks *do* make a good seawall. But now that wall is falling in on the people who built it, with one catch. As it falls, it seems that more little pepper seed are created, and when the wind is good and strong . . . ■

BIOSPACE RESEARCH: SURVIVAL!

As Apollo 11 was returning to Earth after its historic Moon mission, astronaut Edwin E. Aldrin began 'seeing things'—blips of light the size of pinpoints that seemed to appear from nowhere, and passed as quickly as they came.

At a later debriefing, researchers realized that Aldrin's eyes had been penetrated by "cosmic rays"—heavy, high-energy nuclei stripped of their electron shells. While most cosmic rays never reach the Earth (but are absorbed or scattered by the atmosphere), NASA officials were concerned that future

space travelers, unprotected from the radiation, might suffer eye damage.

Subsequent tests show that the rays did little or no short-term harm, but space scientists are still concerned with the effects the beams might have on humans making extended space crossings.

And there are other unanswered questions that may have profound implications for the future of human travel in outer space: Why do bones stop growing and muscles tend to atrophy during space travel? And what effects does zero gravity have on sexual capability and aging?

American biologists got a golden opportunity to further explore these questions recently when the Soviet Union launched *Cosmos 936* from the cosmodrome 500 miles north of Moscow on Aug. 3. The Vostok-launched, unmanned payload carried with it seven experiments designed by scientists at NASA's Ames Research Center, West Coast universities and Veterans Administration hospitals around the country.

Thirsty Wistar rats, time-honored medical surrogates for humans, and 1,000 fruit flies, whose short life cycles provide information on aging and genetics, orbited the Earth for 18.5 days along with experiments from France, the Soviet Union and six Eastern-bloc countries.

The U.S. studies were designed to shed light on how persons in less-than-perfect physical condition might fare in outer space. The robust U.S. astronauts have mentioned only slight nausea, and

tests have indicated minor calcium loss in prior manned flights. But these "minor problems" may, like irregular vibrations in a new car, prove troublesome in older or less fit human models.

If it were not for the Soviet biospace program, U.S. workers would have had to wait for space shuttle operations in the 1980s to continue biological research that has been virtually in limbo since the *Skylab* missions in the early 1970s. With *Cosmos 936* and the earlier *Cosmos 782* in 1975, however, not only have U.S. scientists been able to continue crucial research, they have done it for less than \$1 million—a fraction of the cost to mount a flight.

While the Soviets charged no rent for the premium space, they did make other exacting requirements. The experiments had to be self-contained and require no power, and they had to fit in a small volume of space.

Otherwise, the Soviets "were extremely cooperative in all dealings," and the technicians who processed the U.S. experiments at the north central Asia recovery site (after recovery on Aug. 22) were "top notch," according to Kenneth Souza, manager of the U.S. studies who escorted the samples from Moscow back to the West Coast.

The consensus of U.S. researchers that the project was successful is reiterated by Russian scientists who collaborated on four of the seven studies. U.S.-Soviet meetings convened in California, have discussed future joint biospace efforts. Notes Harold P. Klein, director of life sciences at Ames, "It is possible they might want to fly on the shuttle."



DISASTER FX BY WARREN

Gene Warren, whose special FX prowess is known to FUTURE readers, from such early SF films as *Kronos* to recent thrillers like *Black Sunday* and TV's *Man From Atlantis*, has been signed by Roger Corman's New World Pictures to handle the special effects for the upcoming production of *Avalanche*.

Reader Data

(See "Output" on page 4.)

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Bergman, Alan Carter, Tony, Maya, etc. There is also a complete Timeline and Episode Guide section with photos, credits, and plot synopses for all 48 TV adventures. Compiled under the supervision of the STARLOG editors, the NOTEBOOK is written by David Hirsch and drawn by Geoffrey Mandel, the technical team who developed the Eagle Blueprints for STARLOG No. 7. This limited edition publication (each one will be registered to the owner) is the one and only authorized version approved by Gerry Anderson Productions and ITC Entertainment.

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ESP-FILLED FURY HITS



photo: © 20th Century-Fox



We don't have to tell you. If you read newspapers or magazines, watch television, haunt bookstores, or go to the movies at all, you know about *The Fury* already. It is no secret that producer Frank Yablans wants to make the Brian DePalma-directed shocker into the biggest hit of the Spring season—and he's pulling out all the publicity stops to do it.

By the end of February, fast and colorful coming attractions trailers were in hundreds of theaters. By March 1st, posters of all sizes and shapes were mounted on buses, billboards, and subways nationwide. On March 10th, a two page sneak preview announcement appeared in dozens of major newspapers. Five days later *The Fury* itself des-

cended into 500 theaters and the bulk of the \$5.5 million promotion budget began to be utilized.

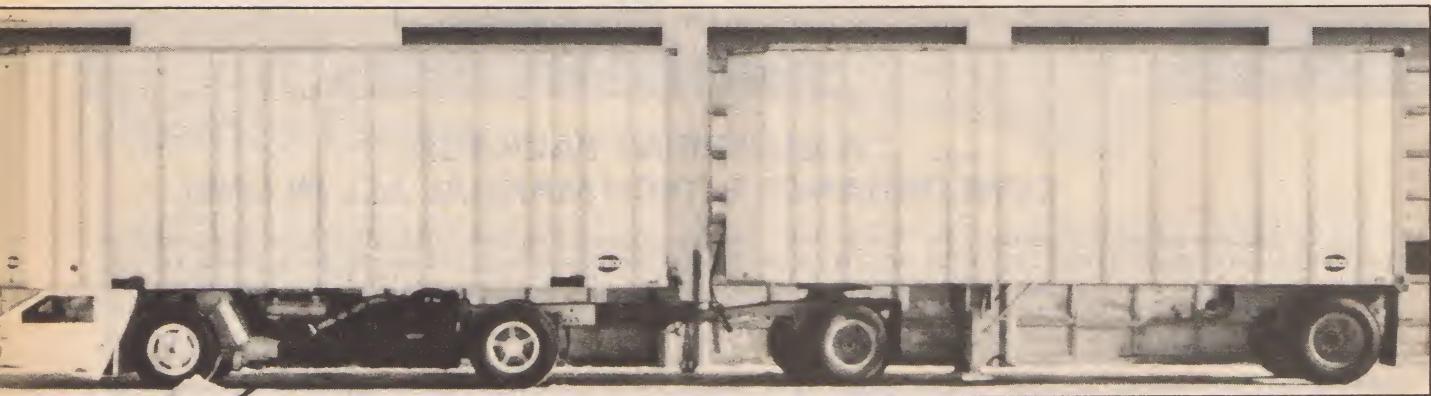
"No one will escape this experience in terror and suspense," proclaimed the pre-release ad. Mr. Yablans is just the man to make sure of that statement. Coming from five years' experience heading Paramount Pictures (1970-1975), he began an independent producing career with 20th Century-Fox which was anything but predictable in style and success.

His first film for the company was *The Silver Streak*, a romantic thriller in the *North By Northwest* vein, which got mediocre reviews but made more than \$100 million. His second, *The Other Side Of Midnight*, a melodramatic tear-

jerker in the *Valley Of The Dolls* vein, was universally panned and went on to gross over \$50 million. *The Fury* is his third critically controversial film, an anything but romantic thriller which Yablans expects to do better than the previous two put together.

Of course it helps to have an all-star cast that includes Kirk Douglas, Carrie Snodgress, John Cassavetes, Fiona Lewis and Charles Durning, and talented newcomers like Andrew Stevens and Amy Irving, but the real heroes of the film are the abundantly bloody shocks which this tale of "death by ESP" incorporates.

Whatever the financial outcome of *The Fury*, it is one of the few oases in an otherwise dry summer cinema season and 20th Century-Fox plans to press their supernatural advantage. Their next major release is to be *Damien: The Omen II* starring William Holden. ■



KEEP ON TRUCKIN'

Before his big hits, *Jaws* and *Close Encounters Of The Third Kind*, director Steven Spielberg did a TV film called *Duel*, in which a motorist fought it out on the highway with the driver of an eighteen wheeler. Fact may follow fancy if the goals of a Federal Department of Transportation study become a reality. Sponsored by the Energy Resources Council under DOT guidance, the study recommends the development of supertrucks in the 1980s. By the 1990s, the study suggests, big rigs should be wider, longer and heavier.

10

Motorists' fears—that they will have to do battle with such supertrucks merely to pass them on the highway—have led to trouble in several states already. North Carolina rejected a bill to allow twin-trailers on its highways, and other states have refused to raise weight and length limits on tractor-trailer rigs. For years, truck manufacturers have been shortening the cab on tractor-trailers to get more cargo space in trailers while staying within length restrictions. Recently, the Strick Corporation, of Fort Washington, Pa., developed a novel idea, the "Cab Under" trailer. An odd-looking con-

traption, the Cab Under is under assault by the Teamsters, who feel it is unsafe to the driver. Strick has two prototype models of the Cab Under on the road now and expects to market the rig later this year.

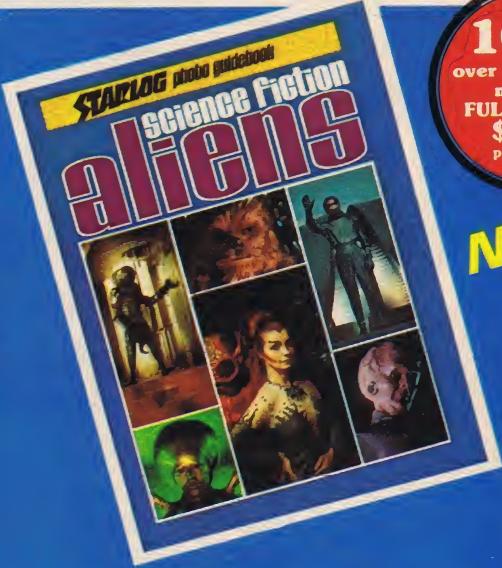
The government study recommending bigger trucks admits its suggestions are "futuristic," but are aimed at developing more energy-efficient motor carrier movement of freight and passengers. The study claims its recommendations would save fuel and money while lessening pollution. The report is still in draft form and has not yet been adopted as policy by any federal agencies. ■

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NY TO LA—21 MINUTES

Another tried and true SF cliche has surfaced in the scientific community, and once again, due to painstaking calculations and deliberation by a real live scientist, the vision is one step closer to reality.

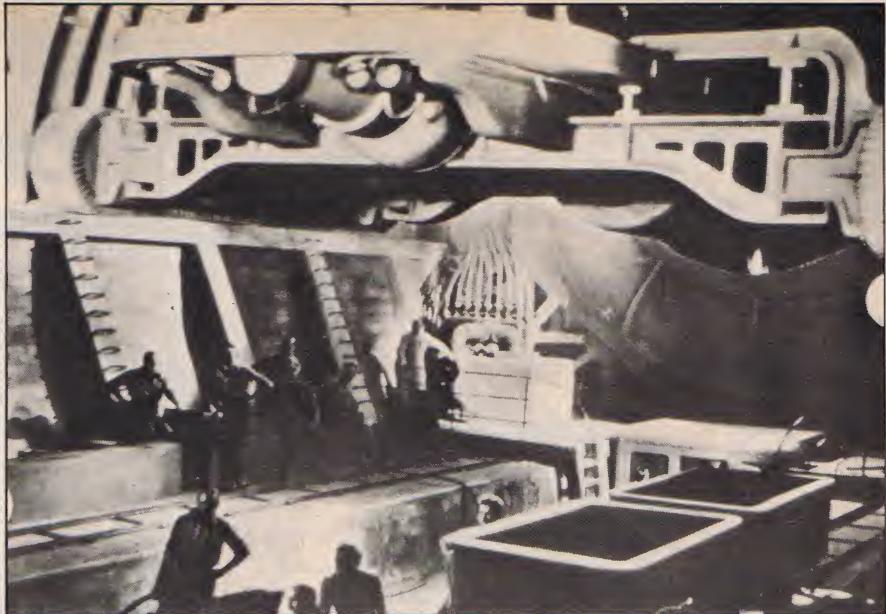
It's the old high-speed underground train gambit: Hop a subway in New York and 21 minutes later you arrive—not in the Bronx, but in sunny Los Angeles.

Rand Corporation physicist Robert M. Salter calls his super-subway scenario Planetran (pronounced planet-tran). He envisions a train that will zoom underground through vacuum-sealed tubes at a top speed of 14,000 m.p.h., floating on electromagnetic waves "just as a surfboard rides ocean waves."

Salter realizes that the money required to actually build his proposed Planetran—about \$250 billion—may keep it in the realm of science speculation for a good while yet, but he points out the need to develop energy-efficient, interrelated transportation systems for the future.

"The technical problems with Planetran development are manifold and difficult," he allows, "but no scientific

Photo: © Gaumont



Transatlantic Tunnel (1933) was an early film look at continent-spanning tunnels.

breakthroughs are required. The present status of our technology allows us to do fantastic things—the hard part is in defining requirements."

According to Salter's plan, relatively straight tunnels must be dug at a depth of several hundred feet, following the

curvature of the Earth. The tunneling itself would account for about 90 percent of Planetran's total cost. Tunnels would be vacuum-sealed, containing an atmosphere as thin as that found at an altitude of 170,000 feet.

Cars would ride on electromagnetic guideways or "tracks," with any necessary course corrections made by hundreds of low-cost microcomputer sensors placed along the length of the tunnel. The cars would contain cryogenically cooled supermagnets for levitation. Travelling electromagnetic waves would oppose the magnetic fields of the cars to provide both support and forward and reverse thrust. For every car being accelerated in one direction, there would be one car in an adjoining tube going the other direction being decelerated. That way the cars slowing down return electrical energy to the system—just like old trolley cars—and almost no energy is wasted.

For purposes of discussion, Salter postulates an initial route from Los Angeles to New York with a whistle stop in Dallas. A non-stop run from New York to L.A. could be made in 21 minutes with a peak speed of 14,000 m.p.h. With the Dallas stop, the entire trip would take 54 minutes and reach a top speed of a mere 6,000 m.p.h.

What would be the effect on passengers accelerating and decelerating to and from supersonic speeds? Using the 14,000 m.p.h. base, people would feel 40 percent heavier at the start and finish of a transcontinental journey.

Salter would eventually like to see Planetran turned into a global transportation system, with undersea tunnels linking continents.

New York to L.A.—or even London—in 21 minutes? Terrific . . . as long as it doesn't take three hours to get out of the station.



WILL IT FLY?

At this stage of the space age, nobody can predict for sure what the first large structures built in space will actually look like. After all, we don't have any space-based construction experience yet (unless you count the makeshift sun shade added on to Skylab after it was damaged on launch). So one artist's conception is as reliable as another. Houston artist, Denise Watt, who paints for NASA's Johnson Space Center, came up with the scenario pictured here. Constructed in geosynchronous orbit, Watt's space station makes use of shuttle external tanks

(the white cylinders linked together) as structural elements where space station inhabitants might live and work.

This space station is being visited by four space shuttle orbiters (look closely) and another, more unfamiliar space-craft approaches.

NASA officials are careful to make it clear that space stations such as the one pictured here exist only in the artist's imagination. Currently the space agency has no budget to build such exquisite hardware in high Earth orbit.

We're glad that at least part of the budget goes for artists—and imagination.

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Photo: David Hutchison



Left: The 11 1/4" Princess Leia doll comes complete with comb, brush, and hair one can style. Below: This ten inch stuffed R2-D2 doll is not only fluffy and comfy—it has a button squeaker as well.



NASA NAMES SHUTTLE CREWS

NASA has named the astronauts who will fly the space shuttle in a series of four orbital flight tests during 1979. Commander of the first flight will be John W. Young, 47, an experienced astronaut who now heads the astronaut office at Johnson Space Center. The ninth man to walk on the Moon, Young is one of only four astronauts who have been to space four times. (The others—Conrad, Lovell and Stafford—are retired from active astronaut duty.) Young's co-pilot on the first shuttle flight will be Navy Commander Robert L. Crippen, 40, who joined NASA in 1969 when the Air Force's Manned Orbiting Laboratory project was cancelled. It will be Crippen's first trip to space.

The second flight will be commanded by Joe H. Engle, 45, and piloted by Richard Truly, 40. Neither has been to

If you think that after *Star Wars*, *Close Encounters Of The Third Kind*, and the entire catalogue of *Road Runner* cartoons you've seen it all, think again. You haven't seen anything until you've seen three buildings filled with grown adults playing with toys for two weeks. Yet this seeming impossibility occurs at least once a year at the Annual Toy Fair in New York, sponsored by the Toy Manufacturers of America, Inc. What made the 1978 Fair different from any other was the fact that this was the convention's 75th anniversary and two words could describe the coming hobby trend: science fiction. And it was good.

Hundreds of manufacturers displayed their fabulous fantasy wares to buyers, distributors, sellers, and reporters, each trying to outdo the next with the complexity and inventiveness of their items. MPC offered a Spider-Man that can actually stick to walls and ceilings; Knock-



O'NEILL'S SPACE STUDIES INSTITUTE TO RESEARCH SPACE HABITATION

Princeton University physicist, Gerard K. O'Neill has announced the formation of an independent, non-profit Space Studies Institute; an organization designed to help research the subject of space habitation. O'Neill, whose groundbreaking book on space habitats, *The High Frontier*, won last year's Phi Beta Kappa award for science literature, stated that "The goals of SSI are to support and engage in research which will develop the 'High Frontier' and the application of existing technology to open for human benefit the virtually unlimited resources of energy and materials now existing beyond the biosphere of the Earth."

It is O'Neill's belief that manned space habitats will benefit the Earth both by processing and developing minerals mined from space and by constructing a network of solar power satellites in space which will beam cheap electrical energy onto the surface of an energy-needing Earth. "Its (SSI's) highest priority at the present time is the purchase of equipment and materials for experiments proving and demonstrating vital components needed in order to bring the 'High Frontier' concept into reality," he added.

The Space Studies Institute is a non-profit organization run solely on contributions made by people who believe in

O'Neill's concept for a better future. And, as much as O'Neill's project is in dire need of funds, the physicist wishes that *all* people interested in space colonies contact him. "I'd love young people who are interested in space habitation to learn more about it," he commented recently. "I'd recommend that, for one thing, they read one of a couple of books on it (*The High Frontier* by O'Neill is available in paperback from Bantam and hardcover from William Morrow; *Colonies In Space* by T.A. Heppenheimer in paperback from Warner, hardcover from Stackpole and *Colonies In Space: The Next Giant Step* by Frederic Golden, hardcover from

about has a three-foot cardboard spaceship for youngsters to play in; Waddington has added 4000 A.D., the game of interstellar conflict, to their inventory; Wham-O has introduced the CE3K UFO Frisbee; Imperial has the bendable CE3K Extraterrestrial—a Gumby-like plastic figure—and one industrious model company is packaging the *Galax IV*, a .049 engine-powered hovercraft complete with a Beta Particle Deflection Shield, a Sub-Zero/High Heat Deflection Shield, and an Ejection Pod.

But the real stars of the show were the Mego and Kenner lines. Mego Corporation, whose previous claim to fame was the Farrah Fawcett-Majors doll, now boasts a tremendous SF collection which includes a *Star Trek* Electronic Phaser Battle Game, a Lazersonic Pistol with six different space sounds, a mind-boggling series of Micronaut related paraphernalia, 12" fully poseable Flash Gordon, Buck Rogers, Superman, Wonder Woman, Hulk and Spider-Man—who has magnetic feet and

space before, but the pair piloted the *Enterprise* during captive flight tests and free flight landing tests. Engle, an Air Force colonel, has been an astronaut since 1966. Truly, a Navy Commander, came to NASA from the Manned Orbiting Laboratory project.

The third flight will be flown by commander Fred W. Haise, 45, and pilot Jack R. Lousma, 42. Haise, a civilian, has been to space once—he was aboard the ill-fated Apollo 13 which limped back from the Moon after an oxygen tank ruptured. Lousma, a lieutenant colonel in the Marines, was the pilot for the second Skylab mission.

The fourth flight will be commanded by Vance D. Brand, 46, a civilian whose one space flight was on the Apollo-Soyuz mission. Pilot will be Charles Fullerton, 41, Air Force lieutenant colonel, who co-piloted *Enterprise* during captive flights and free flight landings. It will be Fullerton's first trip to space. □

Photo: NASA

Harcourt Brace Jovanovich). I'd recommend that they write to our institute and keep informed. They're going to grow up and they're going to be able to help. I happen to feel very strongly that we should answer questions and give information to anybody that writes to us, even if they can't afford to send us a nickel. And any student who can afford the price of a postage stamp will be put on a mailing list. We will mail these people a newsletter that will let them know where we're taking this project and what advances we are making every few months. And that's free."

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hands—figures, the Muson musical home synthesizer, and 2XL—the terrific cassette-controlled home computer for children.

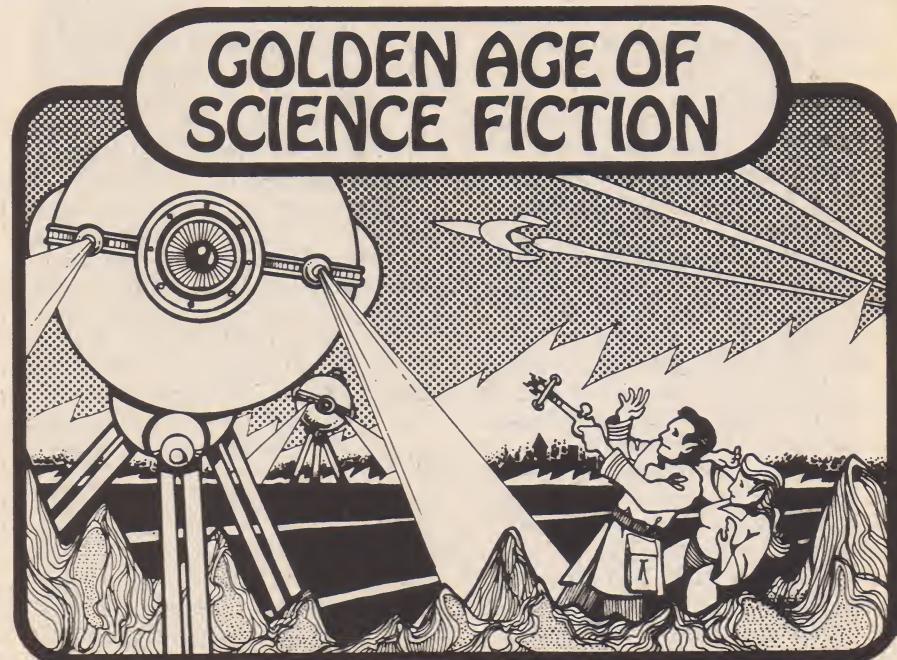
Kenner Toys was never a slouch as far as high quality playthings were concerned but last year they were the lucky recipients of the *Star Wars* account, so their new line-up is literally out of this world. To start: both 3" and 15" action figures, X-Wing and TIE fighters with laser light and sound, a Land Speeder with spring-loaded wheels for a "floating ride," a vinyl Light Saber, a three-position Laser Rifle, a *Death Star* Space Station model with elevators, trap doors, laser cannons, and a trash compactor complete with closing wall and tentacled monster, and even an 8" radio controlled R2-D2.

That is just the beginning, the toy makers were quick to assure their audience. With the coming of *Lord Of The Rings*, *Superman*, *Star Trek II*, and *Star Wars II*, the 76th Annual Toy Fair ought to be a hum-dinger! □

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THAT WAS NO ALIEN, THAT WAS MY WIFE!

During science fiction's Golden Era, the only good alien was a dead alien. On an almost weekly basis, movie, book and magazine invaders from beyond constantly tortured humanity in some perverse way, stealing good-looking women, side-swiping Stutz Bearcats or deep-freezing some hapless hero's beloved uncle into a Sno-Cone shape. Recently, however, the concept of aliens has undergone a cosmic face-lift. Today's visitor from space is no longer the nasty, tentacled creature out to steal the Earth's hubcap supply. On TV and in film and periodicals, the modern alien is portrayed as being one of the boys, the kind of *thing* you can share a drink with or, perhaps, take to a ball game. And not only are today's invaders universally charismatic, they are funny, too.

Funny aliens?

Die-hard SF swashbucklers beware! Soon, bookstores throughout the land will be inundated by the side-splitting intergalactic intrigue entitled *The Extraterrestrial Report*. Published by A & W (the folks who brought forth *Alternate Worlds*, *The Album Cover Album* and *Buck Rogers In The 25th Century*), the book is a hilarious look at a typical SF invasion from space. As conceived by authors Richard Siegel and John H. Butterfield, the work is an exposé of "a suppressed U.S. government document." The classified information reveals a few close encounters loony enough to make J. Allan Hynek a disbeliever.

The Extraterrestrial Report successfully mixes every SF cliche in existence into a slapdash Watergate-from-outer-space stew. Among the famous and infamous personages that populate the work are: the carrot creature from *It Conquered the World*, the Metalunian from *This Island Earth*, a Martian from *Invaders From Mars*, *The She Creature* and *The Hideous Sun Demon*. Adding even a stranger touch of lunacy is the presence of a rather suspect reporter from The New York Times named Lucas Hamill.

The intergalactic imbroglio begins with the discovery of an anti-UFO speech discarded by President Harry Truman. Shortly thereafter, a friendly alien race, the "Rovin," lands on Earth. After signing a peace treaty, the large telepathic creatures begin a barter system with the people of Earth, trading a walking cocktail tray, an ESP developer, a model of their ship and a piece of alien fruit for a Chinese backscratcher, a single snowflake in a lucite container, the saxophone Robert DeNiro used in *New York, New York* and a non-operating facsimile of Robby the Robot (courtesy of Don Post).

Complications arise when a second, war-like race of aliens is discovered by the members of the first Rovin-Human space exploration. Aboard the ship *The Serling One* (code name: *Twilight*), intrepid astronauts Col. Howard F. Gordon and Lieutenant Commander Anthony B. Rogers Jr. discover that the Blight race, which rules 13,000 planetary systems, plan to make Earth number 13,001.

How the world reacts to the little Blighters makes up the bulk of the book. Taking part in the Earthly defenses are the Body Electric from the planet I-Sing, musicologist Hermann Bernard and the Federal Agency for Interstellar Contact—F.A.I.C. (pronounced "fake"). It would hardly be fair to give away the ending, but suffice it to say Johnny Carson has a hand in it.

Besides authors Siegel and Butterfield, nine other artists, editors, writers and designers worked on *The Extraterrestrial Report*. The finished manuscript was handed in to the publishers on November 15, 1977 . . . the day *Close Encounters Of The Third Kind* had its world premiere in New York City. Fate? Coincidence? Insidiousness? Perhaps something more. Some insiders hint that the book may be an organized plan by an alien race to prepare the inhabitants of Earth for a visit . . . or an invasion . . . or maybe even a Martian version of *Monty Python's Flying Circus*. F

STAR WARS SEQUEL ON THE WAY

Star Wars' creator George Lucas has announced plans for a *SW* sequel to begin filming this summer in England. Budgeted at \$10,000,000, the film is slated to begin principal photography in August with actors to commence their scenes some six months later. The space opera sequel promises to be quite different than its predecessor in a number of ways. George Lucas will not return to the director's chair this time around, giving Irvin ("The Flim Flam Man") Kershner a chance at Wookie manipulation. The first draft of the script was written by Leigh Brackett shortly before her death. Ms. Brackett was a science fiction author who had also scripted such films as *The Big Sleep* and *Rio Bravo* in the past. Although no details are known about the script as yet, it has been revealed that it is based on the second of twelve stories from *The Adventures Of Luke Skywalker*, penned by Lucas himself. The first story served as the springboard for the original motion picture. At present, there is talk afoot at both Lucasfilm and 20th Century-Fox that the remaining ten stories could serve as inspiration for an entire *Star Wars* series of space swashbucklers. Thus far, Mark Hamill, Harrison Ford and Carrie Fisher have been signed to recreate their roles as Luke Skywalker, Han Solo and Princess Leia. As negotiations continue for other actors, it is becoming evident that Alec Guinness will not appear in the sequel film in the transcendental guise of Ben Kenobi. Location shooting for the actors involved will take place in both Europe and Africa early in 1979. Lucas himself may or may not be directly involved with the project, acting as unofficial advisor but possibly refusing the title of "Producer." As 20th Century-Fox gears up for *Star Wars II*, Universal and Lucas are making similar movement in regards to a sequel for another one of the prolific director's films, *American Graffiti*. F

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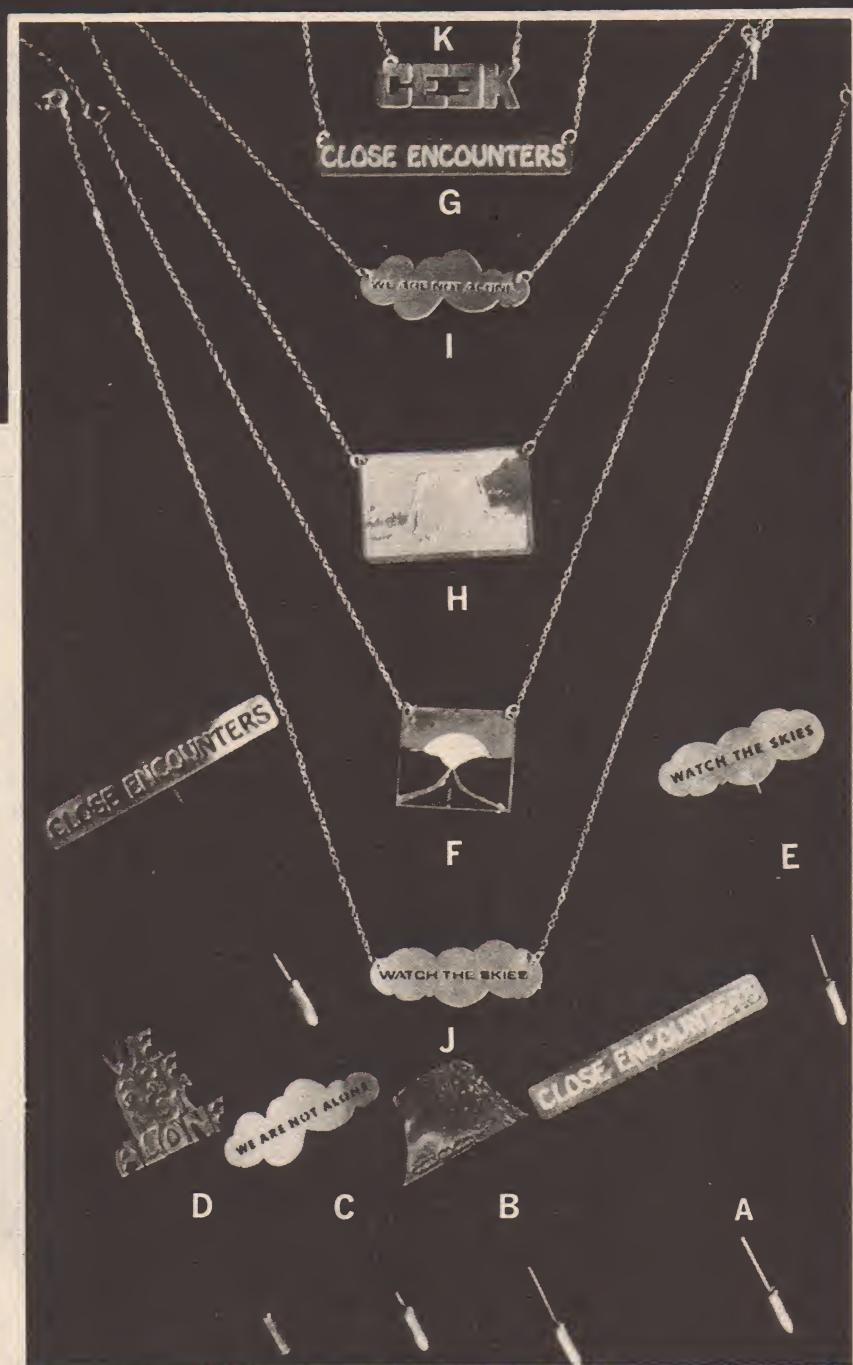
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NASA TO CANNIBALIZE *ENTERPRISE*?

In the beginning Orbiter 101, the *Enterprise*, was intended as a test vehicle. It would perform approach and landing tests in the California desert and undergo vertical vibration tests at NASA's Marshall Space Center in Alabama. After that—perhaps a place of honor in the Smithsonian, while a fleet of eight space-worthy shuttles took over the real work.

Then the orbit fleet was cut back by the Carter administration. NASA was told to make do with four orbiters and keep options open for ordering more later. So space agency penny-pinchers thought it might be an economical move to recycle the *Enterprise* into a working member of the space shuttle fleet. Until recently, the plan was for *Enterprise* to

become the second orbiter to fly to space.

Now it turns out that certain design and structural improvements (results of experience gained from *Enterprise*) are too costly to bring Orbiter 101 up to peak performance. If *Enterprise* were refitted, it would be capable of carrying 5,500 pounds less to orbit than the new improved version.

Back to the Smithsonian? Not in NASA's current money-conscious state of mind. Now the plan is to use parts of the *Enterprise*, together with parts of the "structural test article" (part of an orbiter used in tests by Rockwell, the company in charge of building the shuttles). The crew module (consisting of cockpit and living quarters) from the

Enterprise will probably be combined with the structural test article to form the fifth orbiter sometime in the early 1980s. Until then, *Enterprise* will likely sit in a hangar in Rockwell's Palmdale, California facility.

How many more times NASA will have its plans changed by budget requirements remains to be seen. The ultimate fate of *Enterprise* is still not yet certain, although it now seems clear that it won't be flying to orbit—at least not all of it.

So the letter-writing campaign phenomenon which caused Orbiter 101 to be named in honor of our favorite starship may be in order again. Orbiter 102—scheduled for launch in the spring of 1979—doesn't have a name yet. How does *Enterprise II* grab you? *Millennium Falcon?* *Jupiter 1½?*

PORSCHE-DESIGNED BIKE OF THE FUTURE

The Porsche Design Group, headed by the legendary auto designer Ferdinand Porsche, has just released plans for a bicycle of the future—with several startling features. The new bike will weigh in at 20 lbs.—an attractive weight for racing bikes, unheard of for street machines. In addition, the brakes, cables, and gear-change mechanism are all encased within the futuristic frame itself, which is made out of high-tensile plastic. At first glance it is this one-piece modular frame that catches the eye. Aerodynamically designed, it features a honeycomb type construction, made from synthetic material; it has already been wind-tunnel tested and found equal or superior to traditional bike frames. "What we've come up with, basically, is a new way to link the handlebars, wheels, seat, and crank," says designer John Matthias. One other interesting gimmick they have incorporated means that the old fashioned,



tried-and-true bicycle pump may soon become obsolete. It seems that all you need do to inflate a tire, front or rear, is to lift the bicycle seat up and down—as per standard pumping activity. Now, if

only Ferdy Porsche could come up with a way to eliminate that other big bike bugaboo—the standard bicycle flat tire—the whole thing might not be half-bad.

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They're stretching the limits of "limited" animation at Filmation—for a new TV special on a tried and true space fantasy.

FLASH GORDON!

Conqueror of Space and Screen



Original Flash Gordon Artwork Courtesy Woody Gelman, Nostalgia Press, © King Features Syndicate Inc.



Photo: David Houston

By DAVID HOUSTON

An unusual two-hour animated version of *Flash Gordon*, to be televised in the Spring of 1979, is being prepared by Filmation Studios at this moment—blending the most exhilarating fantasies of with one rather depressing reality. Although the production crew is still several months away from filming the first animated sequences, one rather large obstacle has already reared its ugly little head. Rather than proceed with the adventures of *Flash* as a fully-animated feature, problems posed by a lack of both adequate budget and time decree that the adventures of the noble voyager

will be seen in what is known as "limited" animation. And yet, through a combination of production ingenuity and an excellent script, the feature should be well worth anticipating.

The "limited" animation that has been done for television—by Filmation, Hanna-Barbera, and a few others—has yet to reach the level of sophistication that Walt Disney achieved *40 years ago*. To demonstrate this, pick a time when an episode of, say, *The Flintstones* or *Batman* is on the screen—then quickly switch channels to an old Warner Brothers cartoon or something by Disney. While the new "limited" animation can be highly entertaining, even beautiful at times (consider the animated *Star Trek*),



it can't compete with the old "full" animation in terms of action and visual magic.

And yet the *Flash Gordon* we will see—whose limbs will move one at a time, who will glide leglessly over one-dimensional backgrounds, whose only subtlety of expression will be an occasional smile or blink—this *Flash* will be full of surprises. And the other elements in the animation—monsters and aliens that can be seen from only two or three angles, spaceships incapable of making a three-dimensional turn—are likely to be thrilling, delightful, and thoroughly imaginative. What's more, *Flash*, Dale, Zarkov, Ming and all the other characters will all be placing a foot in the door towards full-animation features for television. The best values of the new *Flash Gordon* will be found in its story and sound track.

The project was born almost two years ago, when executive producers Norm Prescott and Lou Scheimer approached the networks with the idea. NBC offered up-front money and a go-

ahead, but the financial arrangement fell far short of what was needed to turn out a first-rate product. The producers then approached Dino DiLaurentis with a proposition: in exchange for his arranging for additional backing, Filmation would make the product available to him for exclusive distribution in Europe as a theatrical film. DiLaurentis not only bought the idea, he injected himself into the legal maneuver of obtaining the rights to the Alex Raymond comic strips. While Filmation now holds TV and animation rights, DiLaurentis is proceeding to film a live-action *Flash Gordon* at a cost approaching \$20 million. The current budget for Filmation's project is around \$2.5 million, which is a whopper of a budget for TV animation.

Money and rights secured, Filmation then went to Samuel A. Peeples—veteran TV and movie writer (he contributed to *Star Trek*, among others)—and contracted a shooting script.

Peeples, a self-proclaimed *Flash Gordon* fan since the year one, completed the script last winter. Holding to the

Below: Dr. Zarkov's rocket ship appears to be in need of some repairs. Right: the quintessential Flash.



quaint 1930s science and settings, he has essentially taken the first Alex Raymond story, with all its legendary characters, tightened the plot, and worked the story into the framework of an eight-act two-hour TV movie. He has also added delightful touches and fresh ideas of his own, and in the process, has answered some of the annoying questions that dangle from both the Raymond comics and the old Republic movie serials.

Take for instance the fact that Mongo miraculously happens to be a tenth planet of our solar system. In the Filmation version . . .

Zarkov: You've achieved nuclear fission?

Ming: (smiling) A thousand of your years ago.

Zarkov: It is the source of your power—how you have brought your entire planet to our solar system?

Below: A Flash storyboard conference.

Left to right: Karl Geurs, Robert Kline, Mario Piluso, Hal Mason and producer Don Christensen. Bottom of the page: Mongo.

Ming: (nodding, amused) Very clever, Dr. Zarkov—you've guessed, then, that my visit is no accident—that Mongo is no casual wanderer through the cosmos . . . ?

And how is it that everyone on Mongo seems to speak perfect English? In the Peeples version, Ming has created the divergent races through genetic engineering to create a perfect race, and he has been in contact with a confederate on Earth for many years. This device is ingenious, and one gets a chill just reading the script:

Ming touches a control, and the scene shifts, to a concrete blockhouse, and watching Nazi Army officers. One face leaps out from the screen: *Adolph Hitler*. Ming reaches down, touches the screen—almost fondly—then snaps off the video. The screen goes dark.

Ming: (softly to himself) Soon, my friend—soon!

Peeples has strengthened the theme of the story, and at one point allows Flash to name it explicitly:

Barin: Clasp our hands, Lion-man! We three are brothers! (Thun hesitates, frowning, then Flash grins.)

Flash: "Separate and Destroy" (he quotes Ming's master plan)—but on Earth, my country has a better saying—"United We Stand!"

In the Filmation script, each of the eight acts is like the chapter of a serial. Each begins with a line drawing and dissolves into full animation, and each ends with a cliffhanger. And very good cliffhangers they are, too!

(Another angle—the destruction of the sky city)

The troop rockets blast off from the smoking, burning Sky City—and instantly the armada closes in for the final attack. Their ray-guns flare—and eruptions and explosions tear the beautiful Sky City apart! Slowly, like a great ocean liner, it begins to sink at one end, tipping slowly, steeper and steeper, the fantastic towers crumbling and crashing down! It is total, ruthless destruction on a titanic scale!

(Ext. Sky City—Flash, Thun and Barin—Day)

As the great floating city begins to tilt and make its death dive to the surface of Mongo, far below, they are sent tumbling from the palace terrace. Shrubs, stones, statues—everything begins to topple and fall. They are swept over the edge, as the city begins to somersault—and Flash, Thun and Barin fall—beginning the thousands-of-feet drop to death!

(Fade out—End of Act Six)

Even for those thoroughly familiar with the original, there are surprises all along the way.

"I nearly had a coronary when I read the script," said storyboard director Robert Kline, who has the task of translating Peeples' words and descriptions





Flash and Dale Bail Out of the Disabled Ford Tri-Motor

Above: On this and the following pages, a few scenes from the *Flash Gordon* storyboard are presented to FUTURE readers. Right: a vintage Flash profile.

into visual terms. "We wanted to remain as true as possible to Raymond's art style, but of course we had to simplify it somewhat for animation. This is not an easy script to film, even for animation." Imagine the attack a live-action producer would have facing the problem's in the Peeples script. "It just couldn't be done live-action. Not without the biggest budget in Hollywood history!"

Storyboard conferences were still underway at the time of my visit to the studio. Still unresolved were such issues as how much plant life to show on Mongo prior to "our" arrival in Arboria—Prince Barin's forest domain; and how much nudity the network censors would allow (Flash takes a nude swim at one point, and Dale gets most of her clothes ripped off at another). There was a practically nude Dale pinned to a bulletin board. "We went a little too far with this one," producer Don Christensen said with a chuckle.

In almost every department there were drawings, storyboards, or backgrounds in progress for *Flash Gordon*.

Key scenes had been drawn by Robert Kline and were plastered along the halls.

And in a small back office, there was a cluster of gorgeous little clay statuettes!

"We're doing a number of things for *Flash* that we've never done before," Christensen explained. "We needed these three-dimensional figures to allow us complete freedom of camera angle—particularly with the monsters and aliens. I really doubt that we'll use the human forms all that much. This allows all of our departments—whatever scene they're working—to show the creatures from any angle that works best." There was a danger otherwise, he said, that one department might give a dragon one kind of tail and a different department another.

For human action, Filmation is capitalizing on a process that is seldom used extensively for TV animation: rotoscope. For key scenes where close-up facial subtlety or careful full-body action is required, live actors perform the scene for Filmation cameras. The live-action footage is then transferred, frame by frame, to line drawings and finally to animation cells. Disney relied heavily on this process, particularly in his dealings with human figures. Prior





The Giant Stone Statue of Ming in the Caverns of the Beast Man

to *Flash Gordon*, Filmation has used it most in the *Tarzan* Saturday-morning series—for title sequences and some stock scenes. But never have they used it for once-only scenes scattered throughout a single project.

The day before my Filmation visit I had seen a Japanese animated space ad-

venture, *Space Cruiser Yamato*. This was done in typical "limited" animation for TV, and it had a disastrous problem with spaceships. Whenever a ship would turn toward or away from the camera, it would move in segments—almost like an insect—giving the overall effect of ships both jerky and

made of rubber. I wondered how Filmation planned to solve the problem—and found that they had solved it completely!

"We're using models. They're fully constructed and detailed," Lou Scheimer said, "and will be photographed in a live-action studio and then translated to animation footage." Christensen elaborated: "They're painted white and outlined—right on the model—in black. No rotoscoping will be necessary here, because the frames will be blown up to become the line drawings ready to receive paint." Any move a three-dimensional model can make, Zarkov's and Ming's painted ones can make!

Probably the most significant advance being utilized in the making of *Flash Gordon* is something viewers won't notice at all. It's a new animation testing set-up. The big-budget animators, like Disney, typically run whole sequences first just as line drawings, filmed in black and white. This allows



The Digging Machine of the Mole People



The Battle Between the Forces of Ming and Vultan

animators the chance to re-draw troublesome frames, and, most importantly, to restructure the series of drawings involved in any single action—to make it smoother and more realistic. TV animators, sadly, have not had access to this luxury—again because of a lack of time and money. “On *Batman*,” said Christensen, “if it didn’t work the first time, we had to use it anyway.” The same could be said for most other TV animated films.

All that is changed now. There is still no time or money to run through an extra film process, but Filmation has installed a *videotape* system that operates at 24 frames per second—just as 35 mm film does—and allows for *instantaneous* animation checking.

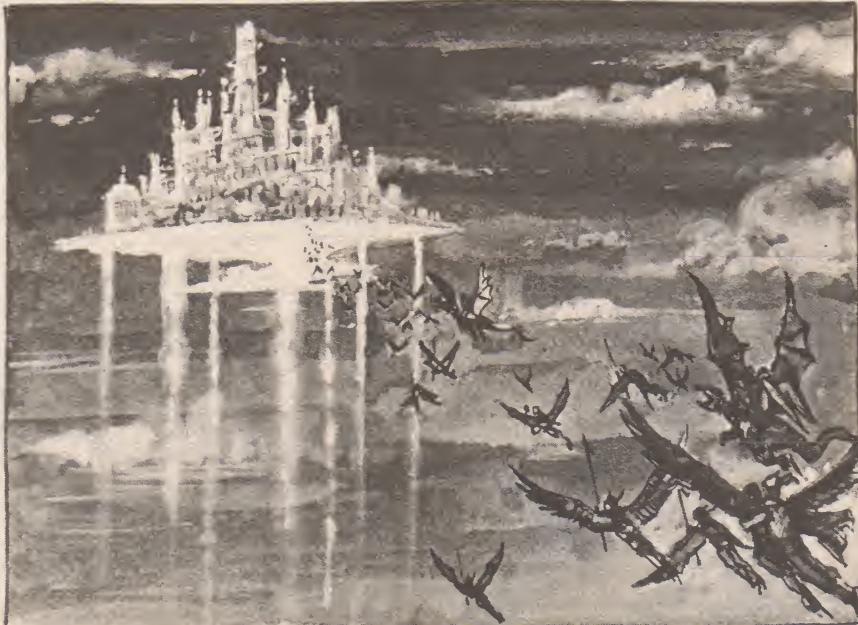
On a test reel that was run, rotoscoped humans combined with non-rotoscoped monsters were seen, along with Flash and Dale, running in a cycle of repeated action to imply continuous motion. Trial after trial was shown on the test reel, until the sequence showed

no hitch at all between cycles and the running had become a loop that could have gone on forever. There were also test sequences for falling meteors, descending parachutes, and prehistoric beasts—fighting and then tumbling off a miles-high cliff.

“All we need to do it perfectly is three more years!” moaned Robert Kline.

Nevertheless, there is every reason to believe that his project will attain a level of excellence rare if not unique in TV animation, and he—and the rest of us—should gain a measure of satisfaction from the fact that the new procedures are being used to bring to life one of the all-time classics of space fantasy—*Flash Gordon!*

Hawkmen with their Captives Approach Vultan's Sky City



OTRAG: This Space For Sale

By JAMES OBERG

Science-fiction writers have often envisioned a time when private entrepreneurs would control the space program, leaving the traditional concepts of government bureaucracy far behind. Robert Heinlein, in *The Man Who Sold The Moon*, portrayed the efforts of an independently wealthy financier who, rather than depend on the government for support, actually had to *overcome* the system's red tape in order to launch a space project of his own design. Heinlein's tale is only one example of a literary genre that pictures the new heroes of space exploration as businessmen, visionary planners who not only solve technological problems, but political and financial ones as well.

At present, science fact seems finally to be catching up with science fiction on this point. An enthusiastic German rocket engineer has actually organized an *alternate* space program! The scientist, Lutz Kayser, claims that he can put together a "space transportation service" that will be able to *undersell* space rates now planned by the United States for its Space Shuttle. Kayser has formed a company called OTRAG (Orbital Transport and Racketen AG) to pursue this goal and has signed a contract with the central African country, Zaire, providing for an equatorial launch site.

Kayser's plans for the future of space exploration, however, are running into

Entrepreneur Lutz Kayser holds a model of an advanced "space truck" which may give the space shuttle competition.



OTRAG's first test launch from Zaire rocket base—a success.

some outright hostility from a few European countries and especially from the Soviet Union, which sees OTRAG's presence in Africa as a threat to their own space aspirations in that area.

In spite of political pressures, Kayser's group keeps its eye on the heavens and continues its research. On May 17, 1977, a small rocket of a new design and principle was launched from a savannah plateau above the Luvua River west of Lake Tanganyika. As planned, it reached an altitude of six miles before falling back to Earth. Kayser's team of rocket engineers (chaired by Kurt Debus, former head of the NASA Kennedy Space Center) believes that they can cluster dozens of these basic rocket systems together in a vehicle capable of carrying tens of tons into orbit and of sending heavy communications satellites into 24-hour orbits. They claim they can accomplish the task at a rate competitive with other existing and proposed launch systems.

To demonstrate the feasibility of their system, OTRAG has announced their intent to launch a small Earth satellite from their African base late in 1979. They hope to develop a cheap, throw-away booster system, built from commercially available components without the need of highly sophisticated (and expensive) technology.

No turbines are needed for their system, since fuel is forced into the thrust chamber by highly pressurizing

the top half of the tanks. No gimbaling is required, the vehicle being steered by throttling engines along the parameters of the cluster. Existing techniques of manufacture are used freely. Some of the parts of the engines are standard fitting valves from automobile windshield wipers. The fuel required is white, fuming nitric acid and kerosene. High power fuels are available, but at a much greater expense.

The question in most space experts' minds at the moment is: can OTRAG's scheme get off the ground? Many rocket engineers in both the U.S. and Western Europe are skeptical. They point to problems of control, reliability and creeping costs that could make the whole OTRAG idea a waste of time. But, despite the global choruses of 'forget it,' there is still the very real chance that OTRAG's engineers just *might* have come up with an idea whose time has finally come.

Most space shots these days are for commercial purposes and involve various government agencies that repay NASA for the cost of the booster and the launch. OTRAG would like to be able to attract the space launch business on a grander scale, wooing the communications-satellite corporations for a start. Other services could be extended to "third world" nations who cannot go into space on either Soviet or U.S. boosters for political reasons.

By dipping into a political stew, however, OTRAG has unavoidably unleashed a flood of repercussions. Late last year, for instance, the young organization became the target of an intense propaganda campaign aimed from Moscow. The echoes of that barrage of verbiage can still be heard and, but for the present Somali-Ethiopia problem, would probably become the biggest issue in Africa.

While the world powers toss OTRAG around like the proverbial political football, Kayser's dedicated band of space explorers continue to work on that high plateau in Africa, assembling, planning, testing. Western governments see them as a threat to national space programs. Russia views them as the perfect tool for a propaganda putsch. Cynics regard them as the creators of the ultimate hoax, or tax dodge.

Yet, in the face of such ridicule, OTRAG states that it has no other goal in mind than to find a cheaper way into space, a bargain-priced ticket that *every* nation could afford. And so, as bizarre as any science-fiction scenario could hope to be, the real-life history of private industry's race for space is written in an atmosphere of international turmoil. Only time will tell if OTRAG's efforts will be regarded as a footnote in space history or the first chapter of a whole new book.



hardware

Some of the latest gadgets and innovations from inventors and manufacturers



Microceptor

by Med General, Inc. Microminiature Nerve Stimulator. Suggested retail price: \$450.00.

The Microceptor, a microminiature electrical nerve stimulator, "... is the culmination of more than a year of research and development aimed at providing the lightest, most convenient portable electronic pulse generator that modern microelectronic technology and human engineering can provide," says Jerald H. Maxwell, president and chief executive officer of Med General. Med General is a leading producer of nerve stimulation systems for the control of acute and chronic pain.

Just how these minute electrical signals, or impulses, which are transmitted through the skin surface to the underlying nerves, can control and alleviate pain is not fully understood. One clinical theory is that these nerves transmit the electrical impulse to the spinal cord, at which point the "pain message" to the brain is blocked. Other theories suggest that other physical mechanisms might be at work.



Coby 1

by Energy Technology, Inc. Electronic Home Control Center. Suggested retail price (with three 115-v./18-a. plug-in remotes): \$595.00.

Microprocessor technology has made possible the creation of the most sophisticated timer on the market today. The Coby 1 control center with its accessory remote switches sets up a computerized Remote ON/OFF control over any of the electrical devices in the home. The special Coby remote plugs, wall switches, or in-line adapters respond to coded signals transmitted by the Coby 1 control center through standard house, building, or normal power wiring without interfering with the operation of ordinary appliances. It turns things

on or off at precise times, at preset intervals—and can be programmed up to eleven months in advance.

The control center also features an elegant digital clock that displays the month, day, hour, minute and second with an accuracy to five seconds per month. The calendar will show the correct date until the year 2021.

The Coby 1 Control includes an Intel 8085 microprocessor plus control circuitry, power supply, emergency power cell, coding and signal-generating circuits and memory. The memory stores device numbers, commands, and status information for up to one hundred Coby 1 remotes.

Detailed information is available from Energy Technology, P.O. Box Q, Las Cruces, NM 88001.

The new device weighs only 2.5 ounces and occupies 3.2 cubic inches — about the size of a small matchbox. It utilizes tiny solid-state electronic circuits, powered by exclusive rechargeable microbatteries.

Inventors and manufacturers are invited to submit items for inclusion in this column. Please forward all information to David Hutchison, Science Editor, FUTURE, 475 Park Ave. S., 8th floor, NY, NY 10016.

Nerve stimulation for the control of pain is based upon developments in more than 10 years of research and evaluation of transcutaneous (through the skin) electrical nerve stimulation in a number of medical centers and pain clinics throughout the world.

The device is available only by prescription from a physician and can be worn comfortably and inconspicuously by a pain patient.



Dixon & Piccolo On VENUS

Don Piccolo, animator, and Don Dixon, space artist, have joined forces to create a seven-minute journey on film to Venus for the Air and Space Museum in Washington.



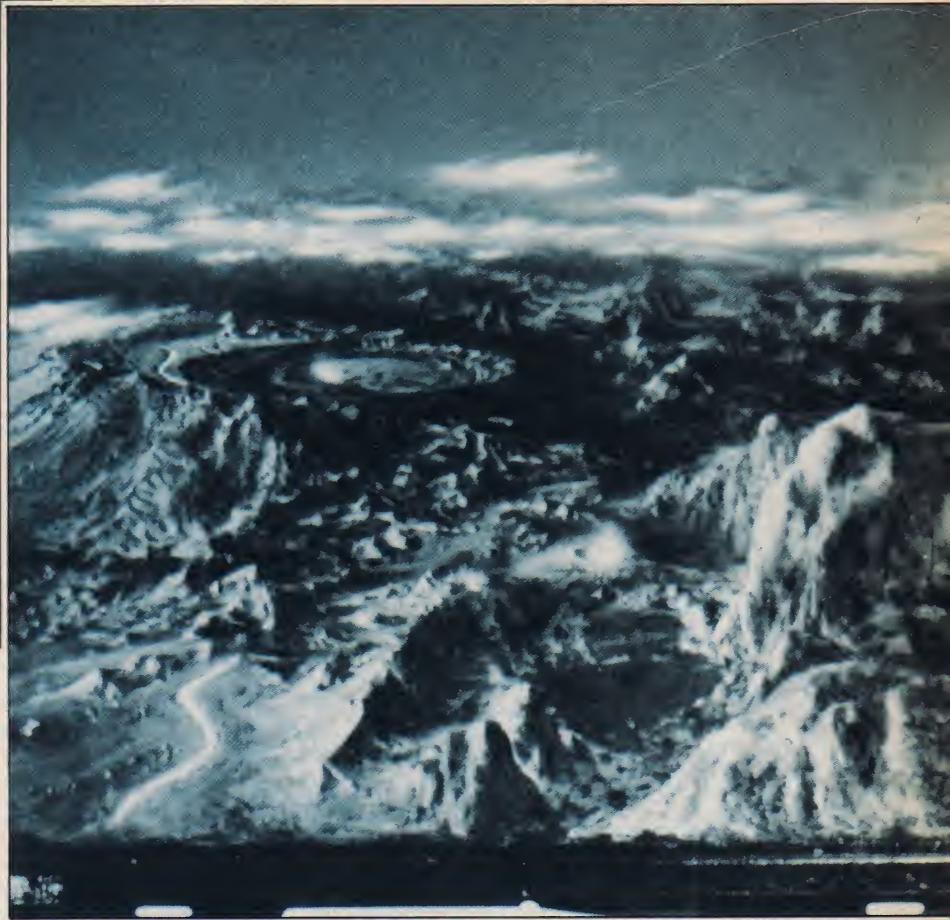
By DAVID HOUSTON

The Air and Space Museum of the Smithsonian Institution in Washington, D.C. plans to unveil a major new exhibit on Comparative Planetology late this spring. Subcontractors are busy completing the various sections of the exhibit, and in Los Angeles, space artist Don Dixon and animator Don Piccolo have just put finishing touches on a fully-animated descent and landing on the planet Venus—their part of the project. The exhibit features a central “control module” where visitors are invited to imagine themselves on a tourist’s excursion to Venus. While standing there peering into the multi-station module, visitors hear “your captain speaking” explaining the views materializing on a set of TV monitors showing the sights outside your ship. The narrative features technical data delivered by the ship’s computer—a voice actually reproduced mechanically. The visuals are exquisite—an eclipse of the Sun by Venus, entry into the cloud layer, breaking through the cloud layer, and a landing and survey of the dark and dramatic surface. Surface features shown include lakes of molten metal, volcanic steam vents, and the odd atmospheric lens-like distortion that bends the horizon so that it seems one is inside a cylinder.

Although the “movie” runs only for about seven minutes, it cost thousands to produce and consumed nearly five months of prime time for the two creators. Much of it had to be done over and over, until something approaching perfection was reached. The cloud overlays refused to register strongly enough,

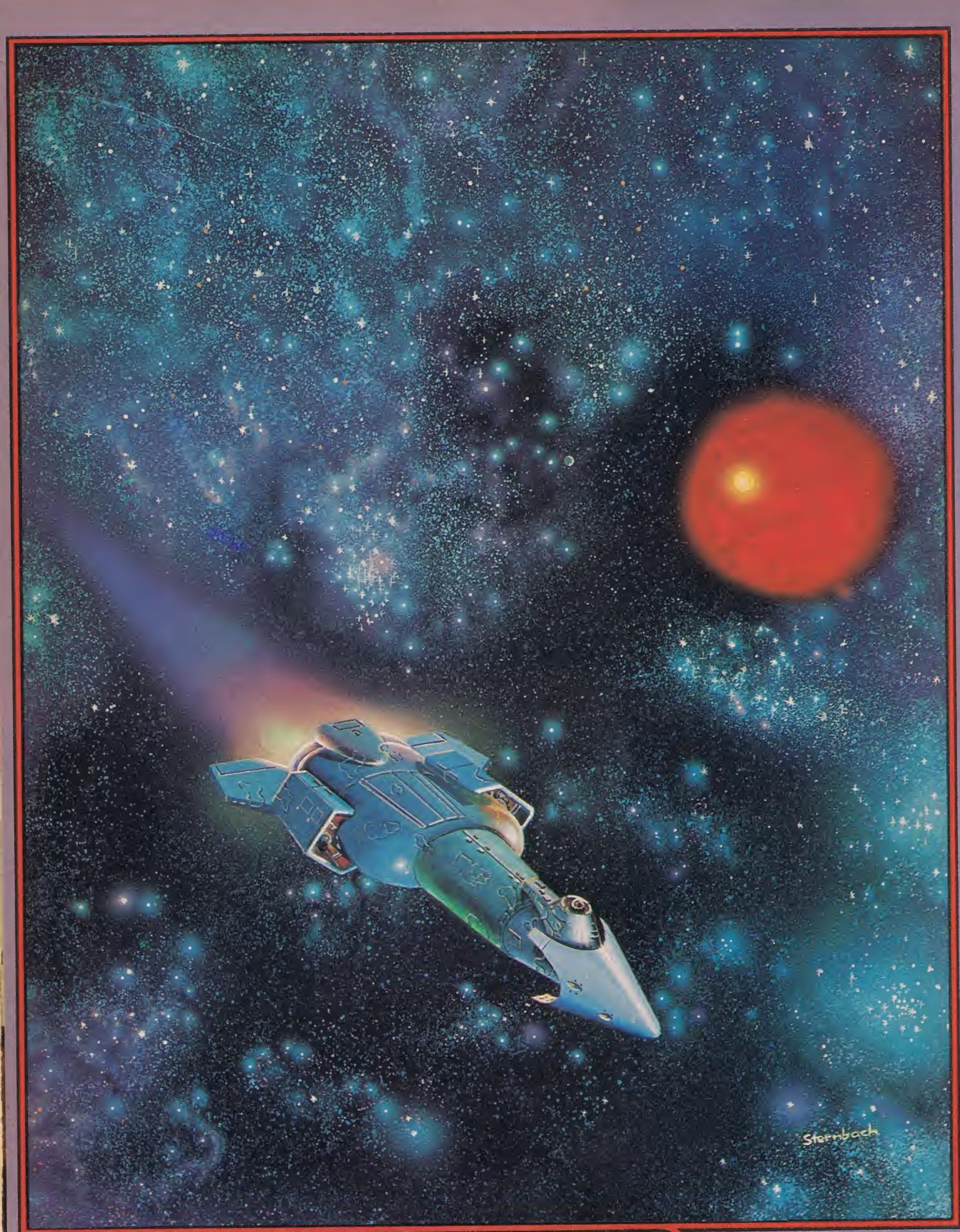
Photos: David Houston

Left: In Venus orbit, the Dixon/Piccolo visualization; our rocket faces the Sun and we slowly move out of the clouded planet's shadow. Below: After breaking through the dense cloud cover the animated film takes us over the hostile world.



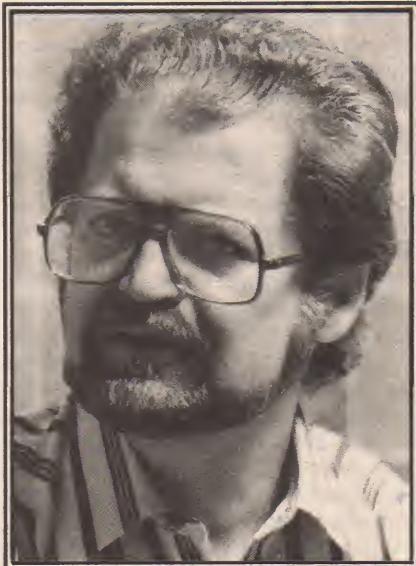
Below: The super dense atmosphere refracts the light of the Sun so that the line of the horizon seems to curve up before an observer on the planet's surface.





Larry Niven and Jerry Pournelle's *The Mote
In God's Eye*, illustrated by Rick Sternbach.

LARRY NIVEN: SOOTHSAYER OF KNOWN SPACE



By JEFFREY ELLIOT

Larry Niven's Tarzana, California home is awash in science-fiction art: posterized reproductions of his numerous book jackets line the walls, along with the lithographs of one of his favorite artists—Salvador Dali. A large collection of light-sculptures also helps to lend an airy futuristic ambience to the house. Niven himself, however, stands in strong contrast to his surroundings; almost professorial in his manner, he speaks with dignity and precision. But setting aside the style of delivery, the words themselves are consistently disarming, frank, and challenging.

"I became a writer," he confesses, "because I ran out of options. I was studying to become a mathematician. In fact, I graduated with a B.A. in that field, coupling it with a psychology major. When I entered graduate school, however, it didn't take me long to realize that I was the dumbest kid in the class. So I decided to quit college after working on my master's for a year." After a difficult gestation, a writer was hatched. Niven considers this period of his life, leaving the room for a moment to fix a brandy-and-coffee.

"I had been daydreaming all my life," he continues. "I always had a story idea in my head." To get the story out of his head, and onto paper, Niven first needed to perfect his technical skills as a writer. To do that, he took an unusual step for a writer: he enrolled in a correspondence course in, of all things, *writing*. "I'm the only guy I know who did it this way. I took the famous writing school course and got two-thirds of the way through it before calling it quits. I spent a solid year at it, then finally sold a story to *Galaxy*. A couple of months later, I sold them

Niven:
*"If it isn't believable, it's
got to be damn
interesting. And if it's not
damn interesting, it's got
to be believable."*

another and then, still, another. The first piece was a brief story which sold for \$25, while the third was a longer piece which brought \$500. By then, though, I became bored with the famous writing school. Make of it as you will, but I quit when we started getting into characterization."

Niven naturally gravitated towards the realm of science-fiction. Inspired, in his youth, by the works of Robert Heinlein, Niven had no problem deciding which field of writing to enter. Unfortunately, he wasn't quite sure just how to go about getting started in SF. And, unlike some SF writers, he received little or no help from the acknowledged masters of the field. "When I first began writing," he recalls, "I worked up my courage and wrote a letter to one of my heroes at the time—Ray Bradbury. I remember

Dr. Jeffrey Elliot, a long time science-fiction fan, has written articles on SF literature for many publications.

asking him two questions: first, where do I find a science-fiction club and, second, will you proofread one of my stories to see where I'm going wrong? His answers were: first, contact Forrest J. Ackerman, and, second, no, I'm too busy." Niven leans back in his chair and smiles. "That's exactly what I would tell anybody who asked me the same thing today."

Surrounded by walls filled with shelves of science-fiction classics, Niven admits that his formal scientific training is negligible, even though he flirted with the idea of becoming a nuclear physicist at one point in his career. "I don't think I would have done too well," he explains. "After taking a general course in physics, it became obvious I wasn't going to understand the subject well enough to do anything with it, especially from a career point of view." Niven kept up with the sciences, however, and the results can be seen in his writing. But he became preoccupied with science mainly because "I was a science-fiction fan. I delved deep into the physical sciences primarily to find out who was 'bullshitting' me and who wasn't. Eventually, I knew who were the 'hard' science-fiction writers. But it takes a certain amount of knowledge to know that sort of thing."

Niven went on to launch a successful writing career of his own, penning such renowned SF works as *World Of Ptavvs*, *A Gift From Earth*, *Neutron Star*, *All The Myriad Ways*, *Ringworld*, *The Shape Of Space*, *A Hole In Space*, *The Protector* and *Tales Of Known Space*. When asked the 'secret' of his success, Niven shrugs and remarks, "If the element isn't very believable, it's got to be damn interesting. And if it's not damn interesting, it's got to be believable."

At the beginning of his phenomenal

career, however, Niven was advised against writing SF, both of the interesting and/or believable kind, full time. He remembers a classic meeting with science-fiction editor extraordinaire John W. Campbell, one of the most influential names ever to come along in science fiction. "The first time we met, he told me quite bluntly: 'Get a job and figure this as a hobby. You can't make a living out of writing science fiction.'"

Fortunately, Campbell's advice went unheeded and, these days, Niven stands as being one of the most successful authors in present day science-fiction. There seems to be no end in sight in terms of Niven's popularity. Indeed, he and occasional co-author Jerry Pournelle recently sold the paperback rights for their latest book, *Lucifer's Hammer*, for over \$200,000 and the book is now in pre-production in full length feature-film form.

Niven readily acknowledges that he has been extremely fortunate in the science-fiction field, with success coming almost immediately. "If you're any good at all," he states, "you'll get to be a 'grand old man' fast in this business. Fortunately, things happened rather quickly for me. I started as a sudden big frog in a very small pool. All of a sudden, the puddle began to expand. As the puddle grew, I seemed to retain the same relative size. I was also helped by some good luck—namely, the New Wave."

The New Wave helped to establish Larry Niven as one of the most talented newcomers around. While many science-fiction writers of that revolutionary period espoused the belief that science homework could be ignored in favor of character development and stylistic experimentation, Niven remained enamored with the established attitudes and methods of such well known science-fiction writers as Robert Heinlein, Poul Anderson, Hal Clement and the like. Referring to his choice during this upheaval, Niven comments: "It [The New Wave] must have been a very seductive thing. After all, who can tell pure sloppy writing from an experiment in style? Perhaps some people can, but they can't prove it even if they can. In fact, a lot of critics in the science-fiction field don't even know the difference."

Niven weathered the storm, emerging as an author capable of writing on just about any idea imaginable. He does admit to being guided by certain themes, however. "There are several ideas which characterize my writing. In fact, I revise my list of 'Niven's Laws' every so often. For example, 'Never throw shit at an armed man.' 'Never stand next to somebody who's throwing shit at an armed man.' 'Never fire a laser at a mirror.' 'FS=K (freedom x security = constant).'"

The author of hundreds of engaging

stories, Niven never seems to run out of fresh ideas. The source of his inspirations? "They come from everywhere," he concedes. "For instance, in the story 'Passerby,' the idea was generated by an advertisement for insurance which I saw on television. As for novels, my ideas come mostly out of the sciences and, sometimes, from works of fiction. After all, these are big complicated stories. You must approach them with serious intent, the desire to create something which will hold together, something self-consistent and likely to be a prediction of the future."

As a prime example of science-fiction writing, Niven doesn't bother to consider the occasional criticism leveled at SF that, while the futuristic elements may hold up, characterization is usually substandard. Niven feels that creating characters in science fiction is the easiest thing in the world. "Look, if I know where somebody came from, and I know the colonization history of the planet, then I know a lot about him. For instance, I can describe an inhabitant of Jinx (one of his mythical planets) and I'm finished. I know a great deal about the Jinxians. I've got some choices available to me. Once you know their backgrounds, you've done your characterization, and their backgrounds are likely to be strange enough to be interesting.

"I once wrote an article on developing new words in science fiction. You can often get by, by picking nonsense words that look pronounceable. They carry you through writing a book, such as *World Of Ptaavs*. But it takes practice. You get better as you go along. I see where Alan Dean Foster is now at the level I was when I wrote *World Of Ptaavs*, so far as the language is concerned. At this point, I'm getting quite good at making words. For example, 'newstaper' is a damn good word for its purpose. It pretty well describes the profession—somebody who wanders around with a video camera and looks for interesting things to shoot."

As well as penning stirring novels on his own, Niven is one of the few SF writers around who has mastered the art of collaboration. He has authored several major works with such prominent peers as David Gerrold and Jerry Pournelle. When pressed on the subject, Niven admits that it's no easy task. "Every collaboration has to be learned. If I were to suddenly start collaborating with Randall Garrett, it would be as though I was starting from scratch. In collaboration with Jerry, the process ostensibly involves passing the manuscript back and forth. We hold long evening conversations over Irish coffee or coffee and brandy, and assign each other various aspects of the story. By the time we start rolling, we've picked our viewpoint characters and decided which parts each of us will do."

But the problem of two talented egos working together invariably poses problems, regardless of whom the writers happen to be. This proved true for Niven and Pournelle particularly when they began working on *The Mote In God's Eye*. Niven becomes more animated, recollecting the embryonic partnership. "When we first started working together, that was a problem. We weren't comfortable criticizing each other's ideas. We've overcome that, though. Each of us feels totally capable of telling the other 'That's a stupid idea!' Usually, if there's a question as to what happens next, we'll thrash it out until one of us gives in. However, before we actually sit down to write the first line of a story, we've pretty much worked out the grizzly details of what's going to happen. Although there are some aspects left undecided, we generally know what line the story is going to take. We usually work from a story outline, which is likely to be as long as 60,000 words. In fact, our outlines are as long as many full-length novels."

Niven is one of those writers who agonizes over the typewriter, one who labors with each word, hoping to find just the right combination. As he says, "The process of writing rarely comes easily. When it does, I'm usually two-thirds of the way through the story. It often never does. Most of the time it's just hard work. I sit down at the desk, talk to myself a little, and stare at the typewriter, as though it were about to attack. Even my wife knows better than to stand around and watch the process. It's a grim sight to behold!"

As prolific a writer as he is, Niven rarely follows a set routine. Instead, he writes when the mood strikes. Fortunately the mood strikes often. Niven views himself as a disciplined writer, but not one who adheres to a fixed schedule. As he puts it, "It's my conscience that kicks me back to the typewriter."

While many authors write for a particular audience, usually one which is fairly broad in scope, Niven approaches his craft from a different perspective. "When I first started writing, my 'ideal' audience was Larry Niven. Now, it's Larry Niven, Dan Alderson, and anybody who might be able to spot holes in my stories. Actually, my audience includes many people who are as bright as I am, but who need things explained to them at every step. In writing a book, you don't think first of the reader, but rather the character you're trying to describe. You don't change characterization to make it easier for the average housewife. Instead, you try to explain things so that the character will be better understood. For instance, you wouldn't change a bartender to make him more believable to a housewife if it doesn't make sense in terms of a bartender."

In assessing the state of science-fiction writing today, Niven is generally optimistic about the future of the genre. As he suggests, however: "There has always been ample room for optimism as well as pessimism. It's true, science fiction has steadily improved over the years. It's also true that there's a lot of bad science fiction around. But we stand on the shoulders of giants. We take the old ideas and elaborate on them in new ways. Take the three books I did with Jerry—*The Mote In God's Eye*, *Inferno*, and *Lucifer's Hammer*. None of the ideas for those books were especially new. Instead, we tried to tackle them from a different vantage point."

When asked about new trends in science fiction, Niven readily admits that he does not foresee the field moving in any one new direction en masse. "A critic once did a review of *Neutron Star* several years back. In his review, he said something which has stuck in my mind ever since—namely, that trends are for second-raters. I believe that. I do see, however, some new developments taking place, one of which is that everybody seems intent upon making a science-fiction movie, what with the sudden success of *Star Wars* and *Close Encounters Of The Third Kind*. I can envision a plethora of such films in the future and, perhaps, even a science-fiction television series or two. I suspect that a lot of dreadful science fiction will be written in the process. A secondary effect of this phenomenon will be that every novel written in the next five years or so will be highly visual in its approach."

Like most other people, Niven has strong feelings about the success of the movie *Star Wars*. "It's the same reason that people start reading Robert Heinlein at age twelve. It's like Edmond Hamilton, except that you don't need an imagination. It's an experience that can be understood by people with no visual imagination whatsoever. Obviously, *Star Wars* is a huge success! Why shouldn't it be?"

This fact does not diminish his enthusiasm for the film, which Niven describes as "fantastic!" "As a film, it's wonderful, although the storyline is a bit simplistic. But the way they treat the storyline, it's superb! For example, they're not satisfied with simply bringing the ship into and out of hyperspace. No, they don't stop at that. They bring you out of hyperspace at which point you're caught in the middle of a meteor storm. It's terrific! I really enjoyed the special effects. John Dykstra did a tremendous job!"

When asked the inevitable question—namely, whether he had a book in his head which he has yet to write, Niven quickly answers, yes. "It will be set somewhere between 1,000 and 10,000 years from now at a time when things have settled down; after humanity has

gone the route of the man-computer link. When I pick it up, human beings will have spent approximately fifty years learning how to be human again. At age fifty, a decision will be made whether they should be allowed to get a man-computer link. If so, they may live thousands of years as a human computer. The human body will remain relatively static. It may even die in the process, leaving the human personality intact in the computer. Man will move around by probes. Actually, I don't know how many computer people I would want around. I really don't know how many the galaxy could stand. But I suspect they will teach men how to be human before permitting him to become a computer."

Niven adds: "when I complete a book, I usually feel it's the best I could do. Often, when I read something now I wrote several years ago, I'm usually startled at how good it is. That's one man's opinion, though. I suspect the reader is better off in deciding how good a critic I am of my own work. Obviously, if my writing is either awkward or obtuse I wasn't a harsh enough critic."

Despite his seeming confidence, Niven is sensitive to the critics, who have not always treated him kindly. "I could tell myself I don't care what they say but, in fact, I get furious when I get a bad review. For instance, a critic, in one science-fiction magazine, wrote a devastating review of *The Mote In God's Eye*. It was chock-full of errors and misquotes. Jerry and I wrote a lengthy rebuttal to the review, pointing out the mistakes that were made with fine sarcasm and contempt. But the editor refused to print it. Instead, he wrote an apology for a couple of the errors, but let the most flagrant mistakes go unmentioned. Needless to say, that got to us!"

In addition to being an excellent storyteller, Niven also sees himself, on occasion, as both a political commentator and a social critic. "Actually, I'm a lazy fanatic! I've always known that I could become a fanatic on some subjects. It's finally happened. For example, I'm in favor of getting into space as fast as possible. I think the salvation of the Earth lies in atomic power plants, with breeder reactors to keep us going for the next hundred years or so. I'd like to see us move our industry into orbit as quickly as possible. Actually, I think we could turn the Earth into a park if we moved our factories into space. And I suspect most of them could do a better job in orbit as well!"

A strong advocate of the space program, Niven has a ready explanation for the present lull and the unwillingness of many people to invest additional resources in further exploration. "I'm continually surprised at people who wonder about that subject. When I was growing up, most of the world was

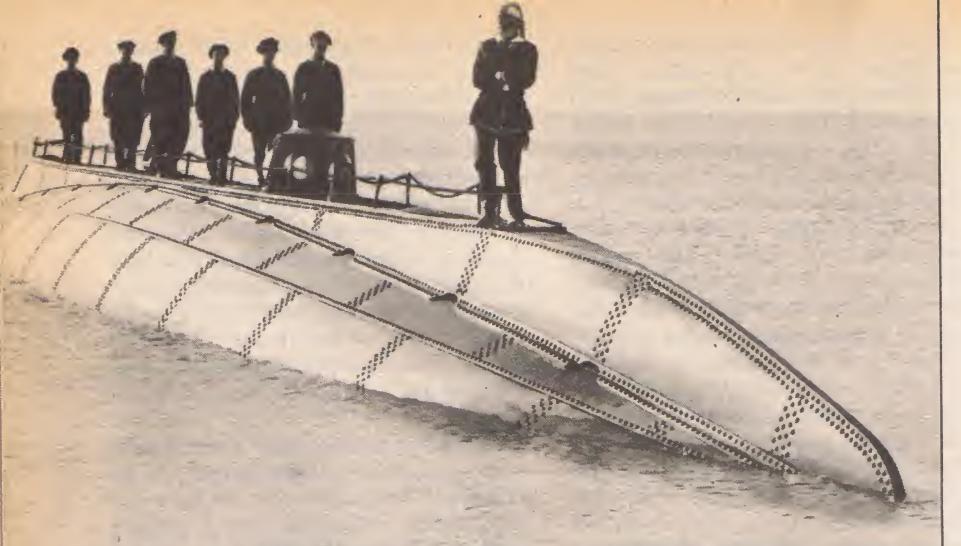
made up of 'mundanes.' My father, who is a corporation executive, is extremely bright. However, when I attempted to explain the dynamics of the multi-stage rocket to him several years ago, he thought I had read it in some science-fiction novel. He was polite, but he didn't take it seriously. Although there is a larger proportion of people in the world today who understand the importance of the space program, it's still only a tiny fraction of the total population. Most of the world is still 'mundanes.' Why is anybody surprised?"

As Niven admits, the issue is considerably more complicated. "The NASA PR flacks are largely incompetent. They talk about getting Teflon frying pans from the space program when they should be talking about those things that go into keeping a heart patient alive. All of the little probes that are used to learn what's going on in the patient's body were invented for use on the astronauts. In fact, everything that was used previous to those discoveries has since been discarded."

When asked to comment on science-fiction fandom, Niven readily obliges: "I get a great deal of fan mail. It's often quite helpful. Occasionally, it's stupid too. However, I always answer the interesting letters. Actually, I get a large number of interesting letters, often from people I've never met before. There was one fellow in Washington, D.C., a guy named MacArthur who did a full proofreading job on *Ringworld*, which he sent to me. It's several inches thick and, I might add, extremely well done. He entitled it, 'The Niven-MacArthur Papers—Part Two.' I used it, of course, when I rewrote *Ringworld*."

Generally speaking, Niven rates his readers high in terms of their critical abilities and overall intelligence. "I think science-fiction readers are more critical than other types of readers. The letters I receive are from people who respond cerebrally as opposed to emotionally to what they've read. Some of the letters are incredible! A number of people have actually done computer work to check the results in *Neutron Star*, which is really only a short story."

Niven also relishes the acclaim that has come his way, which is one reason, perhaps, that he enjoys attending many of the science-fiction conventions held throughout the country. "I have a ball at the conventions. I really like the conversation. It's not too difficult to meet somebody interesting wherever you go. I look forward to catching up on old acquaintances and making new ones. I also like the ego-stroking, the people who come up and tell you how much they enjoy your books. And the autograph hunters, I love to sign autographs. In that sense, I suppose, I like being a celebrity!"



Above: Fogg's balloon from *Around The World In 80 Days*. Left top of page: 1916's *20,000 Leagues Under The Sea*. Middle: *The Mysterious Island of Captain Nemo*. Bottom: *The Fabulous World Of Jules Verne*.

By ED NAHA

He envisioned submarines decades before their time. He prophesied the many uses of electricity in the days when Edison was just starting his work. He described immense airships during the years when Orville and Wilbur Wright were still in diapers, and wrote of helicopters, steam-driven mobile homes, industrialized utopias and the exploration of space by man at a time when most of the populace considered the locomotive the machine of tomorrow. His name was Jules Verne and he is widely acknowledged as being The Father of Modern Science Fiction.

Verne's unique brand of futuristic fiction—was a reflection of his time period. Born in Nantes, France in 1828, Verne studied law before trying his hand at literature. After a few unsuccessful attempts at short story and play writing, Verne turned to the world around him for further inspiration . . . and what a world it was! In the 19th century, science was almighty. During the last half of the century, the first plastic (celluloid), barbed wire, the incandescent lamp, the disc record gramophone, the telephone and the diesel engine were invented. The world was growing smaller. Exploration and innovation reigned supreme. Railroads spread across unreachable lands. Verne was indeed a child of an age of science and invention. It was only natural that he attempt to capture some of it on paper.

His first major novel, *Five Weeks In A Balloon*, was published in 1863. Originally intended as a factual account of the daring antics of close friend Nadar, the work eventually evolved into a piece of fiction recounting the exploration of Africa by air. Verne extrapolated from existing balloon machinery and wound up creating the balloon of the future: a hermetically sealed affair complete with furnace for controlling ascent and descent and a complicated steering apparatus.

That first novel was a huge success, unleashing a torrent of futuristic fan-

Photo: © 1961 Embassy



THE FILMS OF JULES VERNE



Above: James Mason, Pat Boone and Arlene Dahl in *Journey To The Center Of The Earth*. Below: The Nautilus under attack in *20,000 Leagues Under The Sea*.

tasies that would, eventually, influence everyone from Ray Bradbury to Commander Byrd. *Journey To The Center Of The Earth* (1864) described the grand-daddy of all archaeological expeditions, and similarly scientific treks through various (then) unknown regions of the world transpired in *Captain Hatteras* (1866: a North Pole trip), *The Children Of Captain Grant* (1868: a worldwide search), *The Purchase Of The North Pole* (1892) and *The Sphinx Of The Ice Fields* (1897: a North Pole magnet).

From The Earth To The Moon (1865) had the author's heroes blasting off for space from a launch site in Florida (Cape Verne?) and *Hector Servadac, or Off On A Comet* (1877) described what life on a comet would be like for Earth people swept onboard. *20,000 Leagues Under The Sea* (1870) previewed submarine warfare and *Mysterious Island* (1875) gave readers another look at the science-laden world of Captain Nemo.

Various modes of air travel appeared in *Around The World In 80 Days* (1873: a balloon race), *Robur The Conqueror or The Clipper Of The Clouds* (1886: this one featured an aeronef—a heavier-than-air flying machine), *Master Of The World* (1905: Robur returned with



a car-submarine-airplane-ship), and *Propeller Island or Floating Island* (1895). Verne spotlighted scientific gadgetry in *Dr. Ox's Experiment* (1874: a potential light source, oxyhydrogen gas, accelerates life), *The Underground City* (1877: an underground mining camp is supplied with illumination via—as yet uninvented—incandescent lights), *The Bergum's Fortune or The Five Hundred Millions Of The Bergum* (1879: industrialized utopias and concentration camps), *The Steam House* (1880: a mobile home pulled by a steam-driven mechanical elephant) and *The Star Of The South* (1884: the artificial manufacturing of diamonds).

Verne became an international hero, prodding the imaginations of millions into thoughts of the shape of things to come. At the turn of the century, during the infant days of the motion picture industry, Verne certainly seemed a natural for the silver screen. Surely his novels would lend themselves spectacularly to the special-effects wizards of Europe and Hollywood. Oddly enough, Verne was virtually ignored by the movie industry from the very outset. To this day, many movie producers refuse even to look at his work!

The reasoning behind such an illogical act? Well, one of the main objections to Verne's unique sense of wonder seems to rest in the fact that most of his novels are "period pieces," set in a time period almost impossible to update. It would not be as easy, for instance, to bring Phineas Fogg's balloon race to 1978 as it was for George Pal to take H.G. Wells' Martians from Vic-

torian England to present day California.

Still another reason for Verne's virtual obscurity in tinsel-town is the startling fact that not many of Hollywood's favorites have ever *read* Verne. Hastily translated from French in the late 1800's, many of Verne's English editions are clumsy affairs, with readers having to literally punch their way through listless passages in order to get to the meat of the matter. Despite the odds stacked against him, however, Verne managed to make his way into the movie community, both indirectly and directly, by the early 1900s.

* * *

Before any producer felt brave enough to take a chance with the phantasmagorical realm of Verne *per se*, several enterprising film-makers chose to "borrow" freely from the writer's works in order to enhance the early days of screen illusion. Most initial SF films had at least one Verne theme or two incorporated into their plot with often spectacular results. One of Verne's earliest devotees was a fellow Frenchman, Georges Melies, the "Father Of The SF Film." Melies' revolutionary *A Trip To The Moon* (1902) presented a Moon launch via cannon identical to Verne's Moon shot in *From The Earth To The Moon*.

At the turn of the century, while Verne's ideas certainly seemed popular on the screen, his own works received scant coverage. Verne's own film career got off to a fairly ordinary start in 1901 with a French silent short, virtually ignored, based on *Captain Grant's*

Children. It was not until 1907 that work by Verne actually was lensed in a deservedly opulent manner . . . and it was only half-Verne at that. Melies' sprawling *20,000 Leagues Under The Sea* actually had little or nothing to do with the original book.

In this first film version, a fisherman falls asleep in his hut and is approached by the Queen of the Ocean. She promotes him to the rank of a naval captain and leads him through a fantastic ocean world inhabited by nymphs, mermaids, giant squids, sea horses, choreographed crabs and other denizens of dreamland. Diving head first into a Moby Dick-sized sponge, the explorer fights to extricate himself. He wakes up to find himself entangled in his own fishing nets.

20,000 Leagues Under The Sea fared somewhat better in 1916 in the American (Universal) silent epic. Directed and written by Stuart Paton, the film incorporated elements from both *20,000 Leagues* and *Mysterious Island*. In this version, not only does Captain Nemo and his crew meet up with a giant squid but with a few German U-boats as well (World War I was in progress). Nemo, who reveals himself to be the Indian Prince Dakkar, is also aided on his voyage by a castaway girl raised on a primitive island, untouched by civilization. Probably the first back-to-nature teen . . .

Verne's screen adaptations limped along unnoticed and untouted for a few years. Segundo de Chomón's silent ver-

Two marooned travelers discover Captain Nemo's *Nautilus* in Verne's *Mysterious Island*.





Ray Harryhausen's stop-motion magic created this giant in *Mysterious Island*.

sion of *Journey To The Center Of The Earth* appeared in France in 1909, a little-known version of *In Search Of The Castaways* was released in France in 1914 (*Castaways* being the alternate title for *Captain Grant's Children*) and a virtually unknown attempt by Richard Oswald at adapting *Around The World In 80 Days* showed up in Germany in 1919.

Then, in 1929, science-fiction film fans were given a startling glimpse of Count Dakkar's undersea kingdom in the full-length American feature *Mysterious Island*. Using three directors and dozens of special effects, the film pioneered a two-color screen process (early Technicolor) and used both sound effects and valiant stabs at dialogue to enhance Verne's world beneath the waves. In this film, Count Dakkar (never known as Nemo) has two submarines which scour the seas in search of a race of half man/half fish. Captured by Russian agents, Dakkar (Lionel Barrymore) watches his sister (Jane Daly) and her fiance Nikolai (Loyd Hughes) sink beneath the waves in a sub crippled by Russian nasty Falon (Montague Love). The pair of lovebirds falls into the hands of the little fishfolk after saving them from a hungry sea-monster. A fast friendship develops and

Falon is done in by the loyal race of finned wonders. Dakkar dies as well, attempting to protect his newly discovered undersea minions from unscrupulous outerworlders.

In 1934, German director Harry Piel borrowed the title *Master Of The World* for his *Der Herr der Welt* (a 90-minute opus) which starred Walter Janseen, Sybille Schmitz and Walter Franch. The movie mainly concerns itself with the effects of super-industrialization. In 1938, the Russians filmed an appropriately melodramatic version of *Captain Grant's Children*, a decidedly unscientific Verne adventure. In 1941, a stricter SF approach was offered in the E. Penzline-B.M. Chelintzen-directed film, *Mysterious Island*. Captain Nemo and the *Nautilus* were once again the anti-war rescuers of a group of castaways.

In the English-speaking world, Verne lay fallow until a half-hearted attempt at resurrection occurred in 1951 with the Columbia serial, *Mysterious Island*. Having little or nothing to do with the written work of the same name, this production has to be seen to be believed. Directed by long-time screen thrills veteran Spencer Bennet and written by three different writers, this titanic calamity pits poor Captain Nemo (Leonard Penn) against an invasion from the planet Mercury! The script starts off promisingly enough with Civil

War prisoners Capt. Harding (Richard Crane, later TV's *Rocky Jones, Space Ranger*), writer Gideon (Hugh Prosser), sailor Pencroft (Marshal Reed), Pencroft's adopted son Bert (Ralph Hodges) and Harding's servant Neb (Bernard Hamilton) escaping from a Confederacy prison via balloon. Landing on Nemo's island, the castaways are menaced by Mercurian alien Rulu (Karen Randle) who's looking for a radioactive metal capable of producing an Earth-destroying explosion. Nemo and Rulu battle it out and the resulting explosion destroys, not the Earth, but all of Nemo's island...and everyone on it...except our castaway heroes.

Verne's visions of things to come got a somewhat better treatment in the 1952 French animated short *Voyages Extraordinaires de Jules Verne* (27 minutes long, directed by J. Aurel), but the author's crowning screen achievement followed two years later in Walt Disney's magnificent production of *20,000 Leagues Under The Sea*. Retaining all the grandeur of the book while injecting some cinematically needed comic relief (Peter Lorre vs. a trained seal), the movie essentially adhered to Verne's original concept. Following the trail of a gigantic sea creature which has the nasty habit of sinking warships, ocean specialist Prof. Aeronax (Paul Lukas) and aide Conseil

(Peter Lorre) depart on the good ship *Abraham Lincoln* in pursuit. The creature destroys the *Lincoln* at sea and, soon, the Professor, Conseil and sailor Ned Land (Kirk Douglas) are picked up and hauled inside the monster itself; which turns out to be a mechanical ship dubbed *The Nautilus*.

The threesome are introduced to Captain Nemo (James Mason) who demonstrates the power of his metal vessel by taking it underwater. The Captain has invented the world's first submarine and atomic power source, but rather than turning his invention over to possibly warmongering nations, he has embarked on a one-man campaign against all warring powers. Using *The Nautilus* as an instrument of death and destruction, he hunts down and destroys battleships one by one. After a hair-raising encounter with a giant squid, Nemo eventually agrees with the Professor's peaceful ideas of turning over all *The Nautilus*' secrets to the world. The ship heads for Nemo's island lair, Vulcania. Unfortunately, a series of messages-in-a-bottle dropped into the sea by Ned throughout the voyage has alerted the world to Nemo's whereabouts. When the sub surfaces off Vulcania's coast it is ambushed by a fleet of warships. Enraged, Nemo blows up his island - full of secrets. Mortally wounded by gunfire, he takes his loyal crew and his beloved *Nautilus* to the ocean bottom for the last time. The trio of heroes and a sidekick sea lion escape.

* * *

Around The World In 80 Days made Verne a very bankable author (winning The Best Picture Of The Year Oscar for 1956), although some Verne purists cringed at the star-studded representation of Phineas Fogg's (David Niven)

balloon race. Filmed in widescreen Todd-Ao (a first) the movie featured cameo appearances from dozens of stars (at times, at the expense of an already uneven script), fairly unstable direction by Michael Anderson but wondrous visuals. It was truly awe inspiring to watch suave Fogg cool his champaign by simply lowering his balloon into the Alps and scooping up handfuls of ice. But even the visual whammies concocted for the film couldn't conceal its rather cavalier attitude towards the original premise.

From The Earth To The Moon (1958) took its Verne very seriously and, at times, suffered as a result. The film followed the longwinded efforts of The Baltimore Gun Club in their attempts to fire a bullet-like projectile at the Moon via a gigantic cannon launcher. Joseph Cotten was appropriately earnest as Barbicane and Carl Esmond provided a nice touch in a cameo as Verne himself.

1959's *Journey To The Center Of The Earth* was a phenomenal box office success and simply marvelous (albeit a shade juvenile) to behold. James Mason was Prof. Lidenbrock, and Pat Boone played his nephew Axel. The pair, following the lead of lost explorer Arne Saknussemm, journey down the crater of the volcano Snaeffel into an underground kingdom teeming with prehistoric creatures (lizards) and various natural threats. The professor, a lady-friend, Axel, guide Hans and a pet goose manage to slide through most of the terrors before being shot back up to the world above (literally) in a volcanic eruption.

Journey's success paved the way for an onslaught of Verne adaptations which ranged, in depth, from the sublime to the ridiculous. 1961's *Valley*

Of The Dragons leaned more towards the latter. A slight effort on behalf of *Off On A Comet*, the movie told the tale of several Earth folks swept onto a passing comet and meeting a horde of nasty dinosaurs while aboard (courtesy of pounds of lizard film clips from the original *One Million B.C.*).

The same year's *Master Of The World* proved to be a fairly enjoyable blend, plot-wise, of both *Robur The Conqueror* and *Master Of The World*. Vincent Price was Robur, the inventor of the fantastic airship, *The Albatross*. A pacifist, Robur was not above destroying warlike nations from the skies. Among those out to stop Robur are captive passengers John Strock (Charles Bronson) and President Prudent of the Weldon Balloon Society (Henry Hull).

Mysterious Island was yet another fantastic Verne entry of 1961. Based on Verne's sequel to *20,000 Leagues*, the film begins in the conventional runaway balloon motif (an exceptionally well done scene, evoking all the excitement of Verne's passages) before lapsing into sheer swashbuckling as the castaways marooned on Captain Nemo's island are forced to battle giant birds, bees, crabs and squids before being offered a chance for freedom by the captain (Herbert Lom). Nemo and the *Nautilus* perish in a volcanic eruption but the castaways escape in a sunken ship refloated by the *Nautilus'* strong bellows system.

A little less colorful but just as magnificent was the Czech production released in '61 by Warners, *The Fabulous World Of Jules Verne*. Filmed in 1958 in a slightly longer form, this fanciful motion picture was directed by Karel Zeman and derived much of its



plot from *Face The Flags*. The movie was literally a tapestry of Verne concepts with two dimensional engravings animated to life-like proportions actually taking the place of scenery.

As the Verne "explosion" in the cinema subsided, the productions offered grew less and less exciting. One of the last Verne adaptions of any real merit was Walt Disney's *In Search Of The Castaways* (1962). Suffering slightly from script problems (the movie never knew whether it wanted to be an adventure, a comedy or a musical), the film follows the adventures of Mary and Robert Grant (Hayley Mills and Keith Hamshire), Prof. Pagnel (Maurice Chevalier) and Lord Glenarvan (Wilfrid Hyde-White) in their search for missing Captain Grant (Jack Gwillim). The movie follows the helter-skelter pacing of the Verne novel (and was harshly criticized for doing so by single-minded movie critics) and pits the explorers against forces of nature extraordinaire. A broken piece of mountain ledge speeds through a valley like a huge bobsled, taking its passengers to an underground ice world. A momentous flood maroons the brigade in a titanic tree where they are menaced by both a fire and a marauding jaguar. Waterspouts, earthquakes and villain Thomas Ayerton (George Sanders) also provide ample chills.

1962's *5 Weeks In A Balloon* provided little more than boredom for many Verne buffs, transforming Verne's premier novel of African exploration into a rather sad little comedy starring Peter Lorre, Red Buttons and Fabian. Irwin Allen produced and directed this 20th Century-Fox release.

American International's schizoid comedy-adventure of 1967 *Those Fan-*

(continued on page 47)

VERNE AT A GLANCE

20,000 Leagues Under The Sea: French production, 1907. Directed by Georges Melies.

Mysterious Island: MGM 1929. Two color with sound effects. 95 minutes. Directed by Maurice Tournier, Lucien Hubbard and Benjamin Christiansen. Screenplay by Hubbard. SFX by James Basevi, Louis Tolhurst and Irving Reis. With: Lionel Barrymore, Warner Oland, Pauline Starke.

20,000 Leagues Under The Sea: Buena Vista 1954. Color, cinemaScope. 127 minutes. Directed by Richard Fleischer. Screenplay by Earl Fenton. SFX: John Hench, Josh Meador and Ub Iweks. With: Kirk Douglas, James Mason, Peter Lorre.

Around The World In 80 Days: United Artists 1956. Color, Todd-AO. 148 minutes. Directed by Michael Anderson. Screenplay by S. J. Perelman, James Poe and James Farrow. SFX: Ned Mann. With: David Niven,

Robert Newton, Cantinflas.

From The Earth To The Moon: Warner's/RKO 1958. Color. 100 minutes. Directed by Byron Haskin. Screenplay by Robert Blees and James Leicester. SFX: Lee Zavitz. With: Joseph Cotten, George Sanders, Patrick Knowles, Debra Paget.

Journey To The Center Of The Earth: 20th Century-Fox 1957. CinemaScope. 132 minutes. Directed by Henry Levin. Screenplay by Walter Reisch and C. Brackett. SFX: L.B. Abbott, James Gordon, Emil Kosa Jr. With: James Mason, Pat Boone, Arlene Dahl, Peter Ronson, Diane Baker.

Valley Of The Dragons: Columbia 1961. B & W. 79 minutes. Written and directed by Edward Bernds. SFX: Dick Albain. With: Cesare Donova, Sean McClory, Joan Staley.

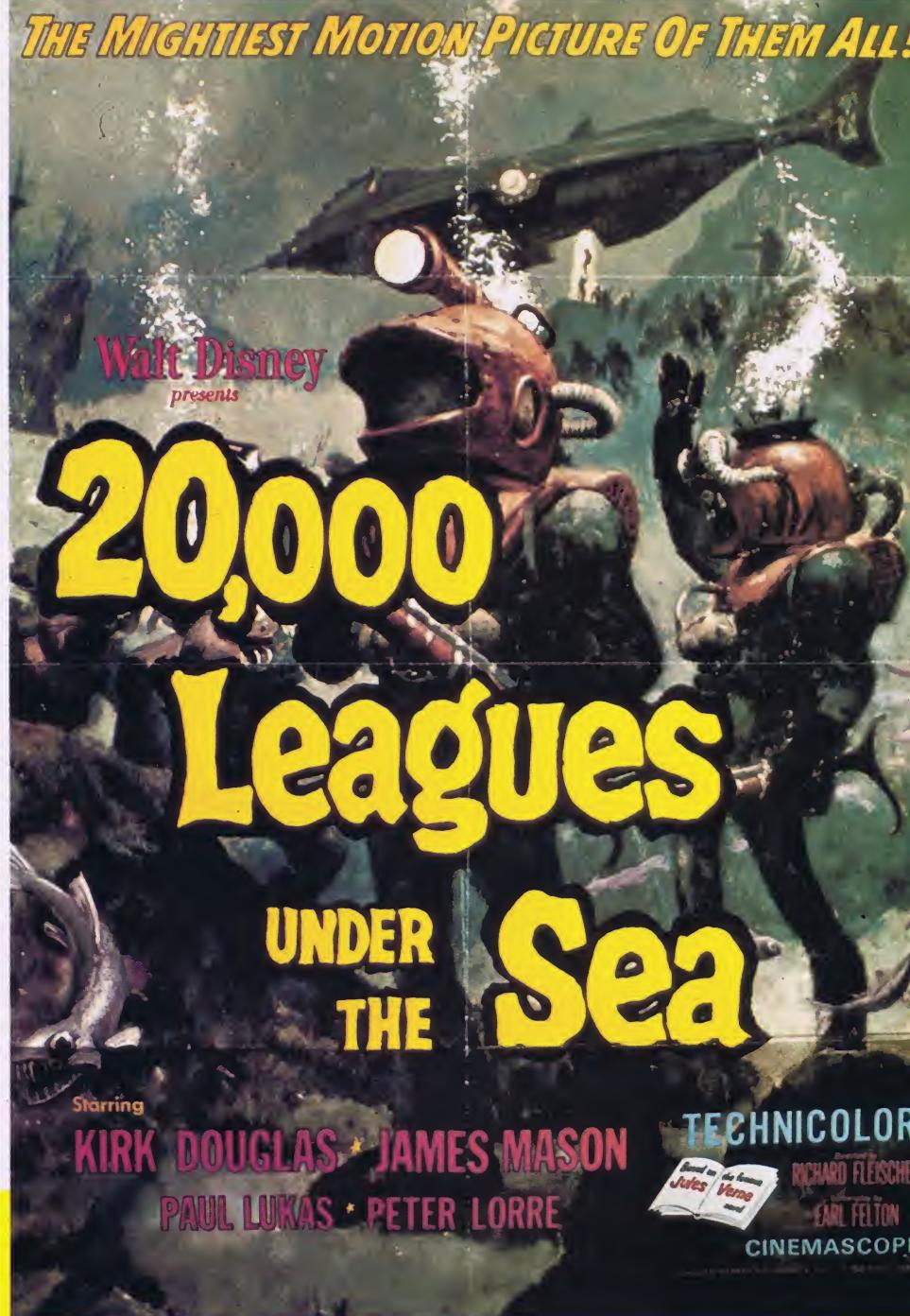
Master Of The World: AIP 1961. Color. 104 minutes. Directed by William Witney. Screenplay by Richard Matheson. SFX: Ray

Mercer, Projects Unlimited. With: Vincent Price, Charles Bronson, Mary Webster, Henry Hull.

Mysterious Island: Columbia 1961. Color. 100 minutes. Directed by Cy Endfield. Screenplay by John Prebble, Daniel Ullman and Crane Wilbur. SFX: Ray Harryhausen. With: Herbert Lom, Gary Merrill, Michael Craig.

Fabulous World Of Jules Verne: Warner's 1961. B & W. 81 minutes. Directed and art direction by Karel Zeman. Screenplay by Zeman and Fratisek Hrubin. Cinematography: Jiri Tarentik. With: Louis Tock, Ernest Navara, Milo Holl.

In Search Of The Castaways: Buena Vista 1962. Color. 100 minutes. Directed by Robert Stevenson. Screenplay by Lowell S. Hawley. SFX: Peter Ellenshaw and Syd Pearson. With: Hayley Mills, Maurice Chevalier, George Sanders.





CHAPTER THREE—The First Hundred Years

Civilization in Space: The Possible Dream

“We hope to realize our goal by the end of this century.
While we may be momentarily slowed down, we won’t be stopped.”



Civilization in Space: *The Possible Dream*

The First Hundred Years

By ED NAHA

Anson Hayes lurched onto his hotel room terrace and, after banging his shin on a fountain ("Who in blazes put *that* there?"), looked out across the vast stretches of sunlit civilization known as Rama. This was Anson's first visit to the habitat in space and, even after two months of professional detachment, he was still secretly awed by the sight of the densely populated cylindrical ecosystem.

Before him stretched a seemingly endless swath of greenery, sprinkled with occasional clusters of housing complexes and underground shopping centers. Above him, on the far side of the cylinder, loomed two identical geographic strips—two more townships of Rama held securely over Anson's head with the centrifugal force generated by the huge craft's rotation. The sight still overwhelmed the landlubber in him. "Never thought I'd see a world more topsy-turvy than Earth," the tall young man mused.

Anson fumbled with the belt of his Rama Hilton bathrobe (made from recycled habitat cloth), before finally managing to pull it tighter. "Hate to get picked up for indecent exposure 250,000 miles from Earth." He made a move to sit in a nearby chair, but misjudging his angle of descent, landed on the terrace floor with a thud instead. His hotel room was on the third floor of the struc-

ture and, on Rama, the higher you got, the lighter you got. Anson was six pounds more buoyant in his room than on street level—a fact he sometimes failed to compensate for. He got to his feet, kicking the chair in a fit of rationalization. "Faulty workmanship!"

Anson was a newsman, one of the new Earth breed. During the early part of the 21st century, a network of news satellites circling the globe had made it possible for subscribers to keep up with all current events via a handy cable hookup within their homes. In effect, every home could have an ever-changing newspaper print-out at their fingertips. The newspapers were hit the hardest, virtually disappearing from the face of the Earth. And televised news seemed sure to follow.

But then, along came 3V (three-dimensional video imagery) and networks rushed headfirst back into the antiquated "personality news" format (first pioneered back in the 20th century). Anson Hayes was one of the most popular 3V personalities on Earth. He was charming, witty, sarcastic, sturdy and had a nose small enough *not* to register on the highly sensitive 3V cameras like the beak of a macaw.

Anson was on Rama to cover its Centennial. One hundred years in space. Rama was a marvel to Earthbound Anson. Everything about it was so . . . efficient. Why, even his hotel room was

arranged to give the relaxing illusion of open space. With over 10,000 people packed into Rama's two miles, the habitat's designers had taken great pains to give the human psyche the reassuring appearance of vastness. Houses were layered delicately between large tracts of fertile land, giving the 1,000-meter stretches of Rama landscape the look of a paradise dotted with small, friendly communities. Anson stared at the grass beneath his feet. Even here, the design was at work. His terrace was, in reality, the roof of the room below him. And that room's terrace was also the roof of the room below. And so on. And so on.

"Genius," Anson admitted. A shame he was leaving tomorrow morning. The doorbell chimed and Hayes saw the friendly face of Geoffrey Merrick on the peepscreen. "Come on in," Anson yelled, running into his dressing room (after first colliding with a who-put-that-there table). "I'm almost ready."

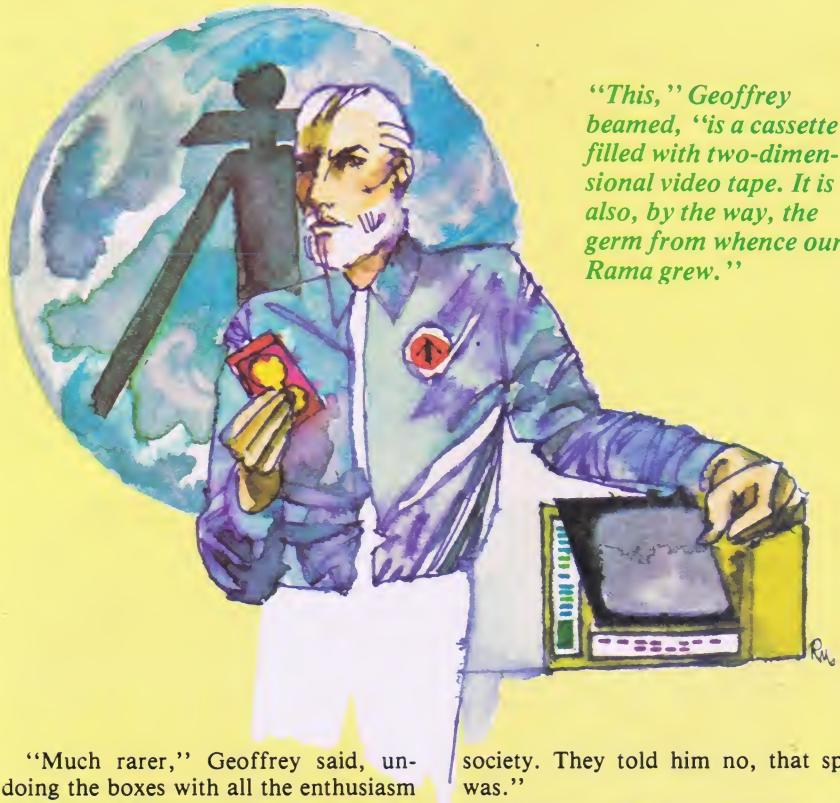
White-maned Merrick, one of Rama's most distinguished (and incorrigible) citizens hurried into the room, his arms filled with boxes. Scientist, mercantilist, thinker, Merrick had spent the last two months of his time attempting to railroad Anson Hayes into a romance with a young widow of his acquaintance. Even on Rama, a fellow had to have a hobby. Merrick dropped the packages on the bed and looked at his watch. "Anson, despite your youth, you have all the speed and grace of a ruptured radio beam."

Anson stepped out from the room, fully dressed. "You're just jealous," he smiled. "At your age, a ruptured ANYthing is an exciting event." The young man from Earth and the bearded resident of space shook hands with laughter. "I'm going to miss your egomaniacal clumsiness," Geoffrey chuckled. "Unless you change your mind and stay, of course. Liz and Tommy are almost as fond of you as I am."

Anson winced as he thought of Liz and her small son. "Now, Geoff, we've been through all this. I had a job to do and it's done. The 3V tapes are packed and ready to be shipped back to Earth tomorrow . . . with yours truly in tow." He stepped in the middle of the room and, after a mock bow, announced in a

The preceding double-page spread:

The *Rama* colony is under construction in low Earth orbit. The Space Shuttle fleet carries material to orbit and deposits it in space. The construction team is equipped with self-powered maneuvering units that do away with umbilical connections.



"This," Geoffrey beamed, "is a cassette filled with two-dimensional video tape. It is also, by the way, the germ from whence our Rama grew."

voice that was half-Shakespearean, half-Karloffian, "The Centennial Celebration of Rama. A 3V Earth Special On The Island In The Sky . . . With your host: Anson W. Hayes—wunderkind."

Geoffrey applauded, "Bravo . . . now come along, boy wonder, or we'll be late." Scooping up his packages, he guided Anson to the elevator leading to the lobby. As the small, tubular elevator car made its descent, Anson experienced the unique and quite unsettling sensation of growing heavier as the elevator plunged downward. By ground level, he'd have those missing six pounds back. The two men argued playfully about Geoffrey's matchmaking antics until they reached the street. Anson then prodded the elderly man into the awaiting electric car. Stepping over the monorail-like track, he jumped into the driver's seat and punched the Sector 6 button. The small car zipped along the rail. "You know I'm fond of Liz and Tom," Anson finally blurted. "But I have my career to think of. Tomorrow I leave for Earth. Period. End of Sentence."

Geoffrey just smiled and patted the boxes on his lap.

* * *

Anson fidgeted in Liz's living room uncomfortably. Like most homes on Rama, Liz's two-bedroom apartment impressed him as being modest but attractive. The parlor was spacious, made more so by two glass walls overlooking the sector. Liz smiled at Anson. He smiled back. "Boy, are you a heel," he thought to himself. "She cares about you." Anson looked at ten-year-old Tommy. The kid had that kind of wholesome face that made you think of mom, apple pie and your first pet dog. Tom grinned at the newsman. Anson felt like the first cousin of Jack the Ripper. The kid needed a father. But it would have to be someone else. Anyone else.

"Draw the curtain, Tom," Merrick smiled. "I have a surprise."

"Ohboy whatissit?" Tommy bubbled, pulling the Beta-cloth curtains around the large windows.

Geoffrey tapped the boxes at his side meaningfully.

"Rare wine?" Anson smiled.

"Much rarer," Geoffrey said, undoing the boxes with all the enthusiasm of a child at Christmas. Anson stood to help the boy with the curtain. Beta-cloth was woven from glass-fiber and was stiff, like denim. Sometimes the curtain needed a good yank to close. He pulled the drapes securely shut and Tommy flashed him an "atta boy, pop" look. "Why doesn't he just shoot me and kill me quickly?" Anson thought mournfully.

Geoffrey placed a rectangular machine on the coffee table. It housed a small viewing screen and was very musty. "What's that?" Liz asked.

"It's a two-dimensional videotape viewer," Merrick beamed. "They were very popular around the turn of the century."

"What a relic," Anson mused, examining the bulky piece of machinery. "And what's that?" he muttered, pointing to a smaller object.

"This," Geoffrey beamed as he picked up the piece of plastic, "is a cassette filled with two-dimensional videotape. It is also, by the way, the germ from whence our Rama grew."

Tommy's eyes dilated to supernova proportions. "Rama started out as a tape cassette?"

"No, no," Geoffrey moaned. "It's what's ON the tape cassette. Remember Dr. Gerard O'Neill, the physicist?"

"Ummm," Anson replied hesitantly. "Yeah, he started the space habitat movement back in, uh, 1969. The offshoot of a simple teaching assignment. He asked his college physics class to figure out if Earth was the most suitable environment for an industrialized

society. They told him no, that space was."

"Right," Geoffrey nodded. "And from then on in, O'Neill and his colleagues worked on everything from the development of the mass driver on the Moon to the design of the first habitat. So, to celebrate our first hundred years, I thought I'd present the man himself." He gazed at the tape. "This was taped by my grandfather in, let's see, 1978. That was right before the first series of shuttle flights but after the creation of O'Neill's Space Studies Institute."

"Wow!" Tom marvelled. "1978. That's before Rama!"

"Yes, but not by much," Geoffrey acknowledged, sticking the cassette into the deck. "Ladies and gentlemen, Dr. Gerard K. O'Neill."

The tiny two-dimensional screen sputtered to life and a middle-aged man appeared sitting behind a teacher's desk. Soft-spoken and articulate, the physicist held before him a model of the first proposed space colony . . . Island One. Crinkling his already lined eyes in a gaze of futuristic depth, he glanced at the model. O'Neill was already theorizing on the importance of space habitation when the audio track began. "You have to be interested in space habitats, space manufacturing and the use of resources in space if you're interested in the future," he stressed. "Because it makes the difference in what kind of future we're going to have. The whole question of what's going to happen if we're limited to resources within our own biosphere has been looked into by a lot of people. The consequences are pretty

clear. We would have to live in a steady-state environment."

Anson found himself watching every blink of an eye, every movement of a hand on the screen. An energy radiated from within this man, a positively mesmerizing force. "It's the difference between a very closed future with a very tight set of rules, or an open future with a great deal of diversity and options. It's the difference between living under a very tight set of fixed, limited physical restraints where one person can't win without someone else losing and being in a situation where you're really unlimited in terms of material and energy resources and people can go off and do their things as they wish."

O'Neill uttered a phrase about "turning to the High Frontier."

where they could put their talents to use. What we're talking about is the difference between exploring ANOTHER frontier of that kind (and there are none left on the surface of the Earth) or saying 'forget it.' We're simply going to spend the rest of human existence closing our minds to the fact that this whole rich sea of resources is there. We're going to limit ourselves to a steady-state situation."

"He talks a good game plan," Anson admitted, admiring the way in which the primitive origins of Rama were made to sound so logical, so natural.

"He gets better," Geoffrey chuckled. "Far ahead of his time."

The historic discourse continued. "I think that eventually the habitats will have a dramatic effect on the ecological

able to return energy to the Earth in great amounts. Let's say we are able to massively solve the energy problems of the world in an environmentally acceptable way, without the use of coal, without the use of nuclear energy, without having to go to a massive traffic of rocket ships hurtling through the biosphere with a payload of power satellites. With power satellites constructed *entirely in space*, you can bring in a kilowatt of power and only lose maybe one hundred watts turning that into electrical energy on Earth. That looks like the least burdensome and most efficient way of bringing additional energy into the biosphere."

"On the nose!" Anson exclaimed, surprised at his own emotion.

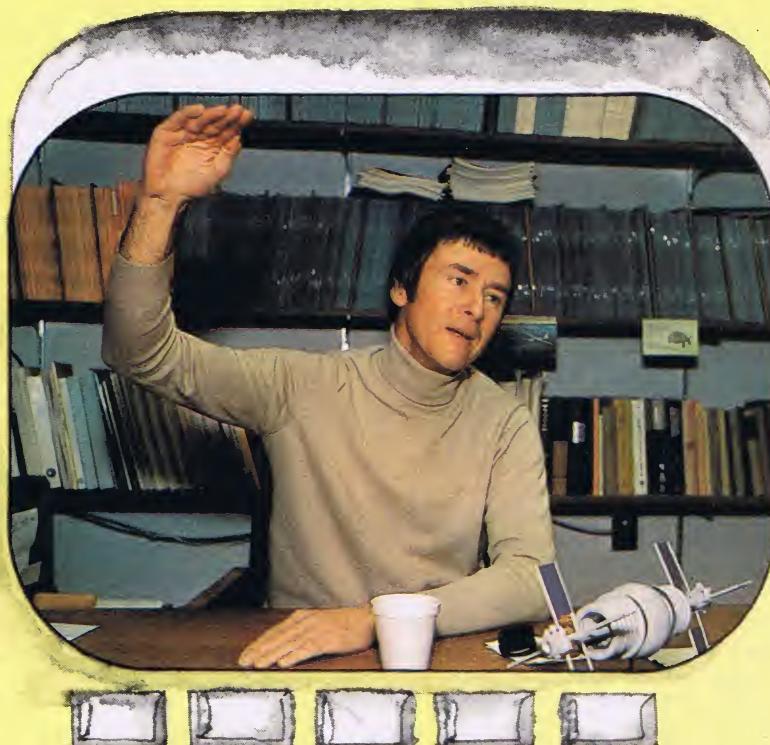
The physicist from the 20th century leaned forward in his classroom, unaware that he was addressing a class more than one hundred years away. "And if we can bring in large amounts of cheap energy, the first effect that it's going to have is the one that has occurred every time everywhere in the past. The standard of living is increased. And when people are above the poverty level, they have some reassurance that their lives are going well. You know, 'Now I know that I don't have to have ten children to insure that one or two will live. I can plan a small family. I'll just have two.' That's already happened in all the developed nations of the world. There's no reason why it shouldn't happen in any of the others. So, there will be an indirect effect this way—in that by increasing individual choice, there will be a decrease in global population rates.

"In the longer run, when you ask what's going to be the effect of the space habitats on the population of the Earth and our environment here, besides clean energy and a higher standard of living, I think that emigration will play an important role. The best estimates that I can make are that sometime between 50 and 70 years from now, emigration from the Earth to space habitats is likely to become a significant drain. The reasons for my saying that aren't based on any violently new concepts of technology. The reasons lie in just looking back on the development of transportation systems over the years in our history.

"For instance, when I was a kid in college there was practically no trans-Atlantic air travel. The idea of traveling even a few hundred miles was considered a big trip at that time."

Tommy stifled a giggle.

"Nowadays, it's commonplace for teenagers to travel by jet airliner all over the world. In terms of relative standards of living, it doesn't cost all that much. So, I think that if that sort of process develops in the next fifty years, we'll reach the point where people can go into space and return paying something that



"Eventually the habitats will have a dramatic effect on the ecological situation on Earth . . ."

"What's the High Frontier?" Tommy broke in over the drone of the videotape.

"It's where we're living right now," Liz answered.

"It was also the title of O'Neill's book about space habitation," Geoffrey pointed out. "A groundbreaking work. It won the Phi Beta Kappa award for science literature in 1977."

As if to explain, the physicist from the last century interrupted Geoffrey's train of thought. "We, of course, are very familiar with the idea of 'frontiers.' We're a frontier nation. Most of our ancestors escaped from relatively limited, rigid societies where they felt they didn't have much scope, to a land

situation on Earth and the population of the planet," O'Neill offered. "Not because of any unrealistic ideas about how people are suddenly going to learn to live with each other any better. I think that human history has shown that we don't get much smarter with the passage of time. We just have more complicated tools and toys to play with."

Anson smiled, hearing this last statement. O'Neill was mirroring Hayes' own feelings about things in general. Feelings he seldom put into words.

"But, let's say that through the construction of power satellites and the mining of minerals in space that we are

will be regarded as a fairly affordable cost. Something comparable to a trip around the world or something."

"Pretty neat," Tommy babbled. "So then he just got all his stuff together and they made Rama, huh?"

"Not exactly," Geoffrey remarked good-naturedly. "Some of Dr. O'Neill's governmental friends were not as futuristically farsighted as the good doctor himself. They were, ummm, . . ."

"Blockheads, huh?" Tommy surmised.

"Out of the mouths of babes," Geoffrey smiled. "Now watch this and remember—this is early 1978. Just see what the colonists of the future had to put up with. A new president had been in office for a year—now listen to Dr. O'Neill."

"Now, what's happened," O'Neill resumed, "is that a number of high officials in the new administration have come in as convinced limits-to-growth advocates. They feel it's wrong to consider the use of nonterrestrial energy and material resources and that the right thing that humanity should learn to do is live within the resources of the Earth, in a steady-state. That's a very easy philosophy to espouse if you've never had a hungry day in your life. But the result has been that some of these people have tried to self-fulfill their own prophesies, cut off this work and close off this option for material and energy sources."

"They're perfectly happy to support things like absolutely pure-science space probes, to go out and explore the distant solar system or the galaxy and take photographs because they have no direct practical application. They're perfectly happy to support low orbital satellites which will do resource monitoring because in a global steady state you would have to have global monitoring of everything. The new possibilities, the new use within our lifetime of material and energy from beyond the biosphere for human betterment . . . that option, they're trying to close off."

"But he won in the end, didn't he?" Tommy asked. "I mean, we're up here."

Geoffrey pushed a "pause" button on the tape deck, holding it down with one finger. "Oh, he won," Merrick chuckled, "but in a most unorthodox manner. *People power* brought space power."

"Huh?"

Merrick lifted his finger and pointed to the screen. "Watch."

"The only reason our work is able to progress," O'Neill smiled, "is that we're being privately funded. We have a little institute which we've just opened called the Space Studies Institute. We get contributions. We even get \$5 bills sent in from high school students who think that the work we are doing is im-

portant for their future. They want the option open. Amazingly enough, the donations that have come in have been enough that we're now going along full steam, even though government financing is decreasing. If we had been dependent upon what we've gotten from the government during the last six-months, I would have had to fire the few people I have working with me."

O'Neill admitted that the very concept of living in space was a stumbling block for many people, but for just as many it was a new and meaningful goal. "To really grasp space habitation you have to break the mental mold and go in a new direction, and that mental switch is just as hard for scientists to make as for ordinary people—maybe harder. I think that scientists are more threatened

feel this tremendous sense of relief.' They didn't go into the technical stuff, the engineering end of things, the diagrams, the formulas. They didn't have to wait for all that. The idea just fundamentally made sense."

O'Neill looked deep into the faces of the space residents living in the realization of his dream. Despite the political problems and money setbacks the space habitation idea was experiencing, the physicist was undaunted. "We hope to realize our goal by the end of this century," he smiled firmly. "We're always going to have momentary blockages. Maybe one, two or three years. But the overall power of what we're aiming for is great enough to say that, while we may be momentarily slowed down, we won't be stopped."



"Every action on Rama held some sense of adventure."

by revolutionary ideas. The regular guy or girl has been used to change all his life. The scientist thinks that he knows what all the changes are going to be. When one comes along that doesn't fit into his preconceived notion of what's going to happen, he's more violently threatened than the ordinary person.

"Ordinary people have been amazingly ready to accept and understand the inner-significance of this idea. I won't say that this astounded me, but let's say it reassured me. It reassured my faith in the common sense of the ordinary people. When these ideas were first expressed in print, the fundamental idea of escaping from the horrible consequences of the limits of growth, the responses just started pouring in. We've gotten letters from people saying 'I've just been feeling terrible for the last few years, suddenly I

The image of O'Neill's smiling face flickered before slowly evolving into a thin white line. The line shimmied slightly and then dwindled into a tiny dot. The speck in the center of the screen flared for a millisecond before disappearing from view.

"That's all, folks," Geoffrey smiled, pulling the cassette out of the machine.

"That was amazing," Liz whispered, still staring transfixed at the darkened screen. "It was like watching history taking place before our eyes. Our own history. Our own origins. His thoughts, one hundred years later, have become our lives. And maybe, in a hundred years, our thoughts . . .?"

"Yeah," Tom nodded sagely. "I thought he had a neat haircut."

Anson walked over to the window and pulled open the curtain. Below him, the populace of Rama celebrated the

EMBARKATION POINT



*"He tumbled over a stationary chair in the waiting room, almost
relishing
the extra fifteen pounds of sluggishness he'd failed to recall."*

Centennial with undisguised ebullience. Public fairs, gaily-colored displays of science, art and design, film festivals and 3V retrospectives unfolded throughout the habitat. Rama. Space habitation. A dream come true. A new way. A new life. A new sense of purpose. Above the housetops, daredevil hanggliders frolicked in near-zero gravity, pulling Rama banners across the mirror-lit sky. ". . . like watching history take place before our eyes," Liz echoed in the back of his mind. Tomorrow he'd be leaving, taking his 3V tapes with him. Leaving an experiment that, despite his terran prejudices, he cared about very much. *"While we may be momentarily slowed down, we won't be stopped."* Anson turned and faced Tommy, Liz and Geoffrey. "I . . ."

Conversation in the room stopped for an awkward moment. Anson cleared his throat uncomfortably. "I . . . gee, I wonder how 3V will handle the rest of the Centennial up here?"

Geoffrey shrugged, "You mean the local station? They'll do their best."

"Thorough but not imaginative," Liz laughed.

Anson Hayes stood at the spaceport at the far end of the cylinder. "Ticket, please," a space stewardess droned. Anson numbly handed her a slip of paper, watched her shred it and hand him a considerably shorter piece of parchment in return. "Move it, willya? You're holdin' up the line," someone behind him barked.

Instinctively jumping aside, Anson once again forgot that the higher he was, etc. etc. He tumbled over a stationary chair in the waiting room, almost relishing the extra fifteen pounds of sluggishness he'd failed to recall. Every action on Rama held some sense of adventure. Anson looked up at the concerned face of the stewardess. "I'm all right," he laughed. "In fact, I'm fine."

The stewardess regarded Anson with a stare reserved for space-traveling conventioneers and Earthbound lunatics as he walked, still laughing, to the spaceport door. Anson stared at the cityscape of Rama. The Island In The Sky. It wasn't Utopia, but it was a remarkable community. A collection of unique individuals united in a common bond of adventure. Sure, they worked towards survival, a continuation of the space habitat, the creation of new habitats. But, more than that, they worked at *living*. At feeling alive. They experienced life in their topsy-turvy realm. Anson stared at the package of 3V tapes in his hand. Even now, every nerve ending in his body tingled at the experience of Rama.

Hastily, he scrawled an address on his parcel and ran back to the flight stewardess. "Ms.," he ventured, putting his ticket on the parcel.

"Do me a favor will you? This package is going to take my seat." He fished in his pocket for Earth currency. "Here's a wad of dough. Can you give the box to a messenger at the Earthport?" The girl's eyes widened realizing she was talking to THE Anson Hayes. "Why, certainly, sir."

Anson flashed one of his patented 3V smiles, picked up his luggage and walked out of the spaceport. He made his way to the elevator leading back to the streets of Rama. He'd be taking a big chance staying here. This was still a frontier town, really. He knew that. He could conceivably be ruining a great 3V career. But Geoffrey had said that they could use a little imagination up here, and he knew he had plenty of that. Besides, it was always onward and upward on Rama. That sounded good . . . and he felt better.

As the elevator slowed to a complete stop and Anson tumbled out into the mirror-reflected sunlit street, he wondered if the local 3V station would *really* have any room for him on their roster. He climbed into an awaiting electric car and, with a shrug, pushed a button.

"Hell. There's always radio."

NEXT ISSUE
Chapter 4—
Rama Centennial
Festival of the Arts

JULES VERNE

(Continued from page 39)

tastic Flying Fools (called *Jules Verne's Rocket To The Moon* in England) was loosely based on a horde of Verne works (including *From The Earth To The Moon*) and was low on the fantastic but high on foolery. In this one, P.T. Barnum (Burl Ives) attempts to launch a midget to the Moon via a large cannon. Sabotage sends the missile into Czarist Russia and soon Troy Donahue, Gert Frobe, Lionel Jeffries and Hermione Gingold are traipsing across the Tsar's territory in search of the astromidget.

Captain Nemo And The Underwater City (*Captain Nemo And The Floating City*) was a 1969 MGM entry into the Verne sweepstakes featuring Robert Ryan as the dour captain who, this time, moors his *Nautilus* in an underwater Utopia discovered by square-jawed Chuck Connors and slack-jawed Lucianna Paluzzi.

Karel Zeman, last heard from with *The Fabulous World*, attempted to recreate the spirit of the master once more with *Na Komete*, a 1970 Czech version (unreleased in the U.S.) of *Off On A Comet*. Emil Horvath and Magda Vasaryhova starred. 1971's *Light At The Edge Of The World* was such a bad adaption of *The Lighthouse At The Edge Of The World* that, in most theaters, it opened and closed within days. Directed by Kevin Billington, this violently vile melodrama pitted lighthouse keeper Kirk Douglas and pirate Yul Brynner in a struggle for supremacy of both the Lighthouse and shipwrecked Samantha Eggar. Adding insult to injury was 72's Italian-Spanish-French production of *Mysterious Island* featuring Omar Sharif as Nemo. Directed by Uan Antona Bordem and Henri Colpi, this one has yet to surface stateside. 1977's Italian production of *Journey To The Center Of The Earth* boasted oversized ape-men without the benefit of Pat Boone.

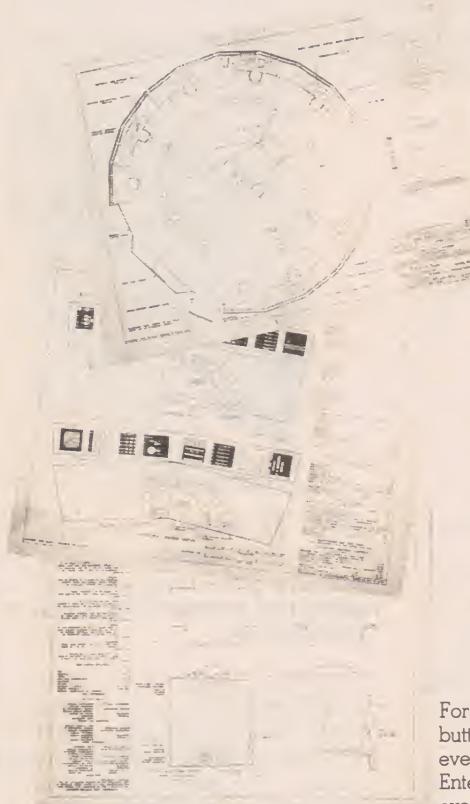
And so rests the work of Verne on the silver screen. Shunned by some film-producers, deified by others, manhandled by more than a few, the Father Of Science Fiction's imagination still stands as a prime source for future SF period pieces. Nemo has been resurrected by Irwin Allen for CBS' *Return Of Captain Nemo*, leaving the door open for other Verne teleseries. Just imagine. *Off On A Comet* filmed by George Pal. *From The Earth To The Moon* presented by Irwin Allen. *Dr. Ox's Experiment* as envisioned by Charles Schneer and Ray Harryhausen. The teleseries *The Floating Island*, produced by Gene Roddenberry.

Wishful thinking? Perhaps, but it's not beyond the realm of possibility. In the fabulous world of Jules Verne anything can, and often does, happen. □

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Future Forum is designed to expose our readers to the thoughts of a variety of experts in the fields of science fact and science fiction. Each issue will pose a new question to our "guest panel" on a particular aspect of SF, space-age technology or future trends. This issue's question:

Is scientific accuracy essential for good science fiction?



Forrest J. Ackerman:
Winner of the first Hugo, editor/agent/SF fan Ackerman is believed to have the greatest collection of science-fiction on Earth (a 4-story 17-room 200,000 piece museum of memorabilia). He edited the legendary *Spacemen* magazine, the *Starlog* of its day.

I don't think it's essential but I certainly consider it desirable. I don't know enough *real* science to detect whether I'm being led down the fairy path so I like to feel I can trust an author like Clarke, Asimov and Heinlein. Mars' moons circling the red planet in the *same* direction didn't destroy the magic of Bradbury's *Martian Chronicles* for me, but who would write a serious historical work about the Civil War and have Grant *pick up the phone* and dial Richmond? (For fantasy, fine!) My all-time greatest SF favorite (in tandem with *Childhood's End*) is S. Fowler Wright's *The World Below*, which may not have a speck of actual science in it for all I know (not having had the opportunity to reread it for too many years) but the *speculation*, imagination, extrapolation, as in the *chef's d'oeuvre* of Olaf Stapleton, seem convincingly logical.



Bjo Trimble: SF artist, fan, writer and editor. Motion picture makeup artist and costume designer. Author of *The Star Trek Concordance*.

Scientific accuracy is important to good science fiction *only* if it is (a) an integral part of the story itself or (b) would detract too much by *not* being accurate. We can accept a bar (in literature or in movies) full of varied alien beings who probably—in reality—could not breathe the same air. However, if we (or other aliens) are trying to live on a planet, the air being breathable is most certainly an important point in the story and scientific accuracy or at least reasonable guesses are definitely important. We can accept *Star Trek's Enterprise* or starships in literature zipping across space in a matter of hours/minutes/nano-seconds if our "willing suspension of belief" wants to accept the *getting there* as only a sort of necessary evil to continuing the story in an interesting environment on another planet or in another universe or time-period. However, if the entire mode of travel *is* the story, then (as in Poul Anderson's *Tau Zero*) the scientific talk *about* traveling through time and space had *better* sound accurate,

anyway. In discussing "scientific accuracy" in science fiction, we are being somewhat ambivalent, anyway. A really, truly scientifically accurate story would have to stay well within the realm of *known* accuracy and not go into any flights of "might-be" or "what if," which is the basis for any kind of good story-telling, no?



Poul Anderson: Hugo and Nebula award winner, author of "Sam Hall," "Kyrie," "The Longest Voyage," "Call Me Joe," *Tau Zero*, *Three Hearts And Three Lions*, *There Will Be Time*, *Brain Wave*, *No World Of Their Own* and *Sister Planet*.

Yes and no. Probably most science fiction, including most of the best, is inaccurate in the sense of departing, one way or another, from what we think we know today. For instance, it often allows faster-than-light travel, though it may be meticulous in every other respect (e.g., the work of Hal Clement). Of course, what we know today is probably not the final answer, in physics or anywhere else.

Some fine science fiction has been inaccurate in the sense of flouting the most elementary knowledge. Bradbury's *The Martian Chronicles* is an obvious example. Nevertheless, from a literary viewpoint this is a good book.

As a rule of thumb, I'd say that, though he may choose to depart from scientific canons, the writer should know what they are and what it is that he is doing. This is no different from the requirement that writers of any kind be familiar with their material.



John Brunner: Hugo Award winning author of *Stand On Zanzibar*, *The Sheep Look Up*, *The Shockwave Rider* and *The Whole Man*.

In science fiction you have to know what isn't known yet. You can make a complete ass of yourself if you let yourself get badly behind what's going on. I read *New Scientist* and find it tremendously helpful. I've read every single issue since it was first published twenty years ago. I also read *New Society*. I get quite a few story ideas this way. I can keep track of what the big scientific debates are at the moment, so if I find myself in need of some particular piece of scientific information I know that I can probably find somebody who knows it. I don't try to be 100% accurate but I do like to know when I'm being inaccurate.



David Gerrold: Author of *The Man Who Folded Himself*, *The Trouble With Tribbles* and the forthcoming *Deathbeast*.

A good story should be believable in every element—if it is science fiction, then it is the author's responsibility to make the science in it as accurate as possible. This extends beyond just having the math check out to the umpteenth decimal point; it means that the author should also understand how technology works, and what the scientific method is; this attitude should be

reflected in how the characters deal with their problems. Science fiction is a literature of ideas—we should see intelligent characters who are unafraid to explore ideas. Characters who are anti-science tend to look like idiots.



Ilya Salkind: Co-Producer of the forthcoming motion picture, *Superman*.

Yes, in stories that are unidentifiable to present-day science. However, in the event of the total fantasy I do not think it is important.



Joe W. Haldeman: Hugo and Nebula award winning author of *The Forever War*, *Mindbridge* and *All My Sins Remembered*.

Scientific accuracy isn't necessary for good science fiction, but scientific *inaccuracy* kills it. That is, you can write a good science-fiction story without any science, but a writer who blathers about *any* subject without knowledge of it is going to create ugly fiction.



Vic Ghidalia: SF anthologist and consultant, editor of *Feast Of Fear*, co-editor of *The Venus Factor*.

Scientific accuracy is essential for good science fiction. In the era of unenlightenment, the space operas of Edmond Hamilton and Jack Williamson were at their height. However, today's science-fiction reader is fully aware of technological achievements, and with apologies to *Star Wars*, he will easily distinguish between science fiction and mere science fancy.

This is not to eschew science fantasy because, labelled as such, it has a definite place in the realm of speculation about the worlds of If and Maybe.



L. Sprague de Camp: Author of *Genus Homo*, *Lest Darkness Fall*, *The Dragon Of The Ishtar Gate*, *The Goblin Tower*, "Language For Time Travelers" and "A Gun For Dinosaur."

Yes.

video.images

Science fiction & fact on television

Edited By ED NAHA

Photo: © ABC



With the current television season stumbling to a close amidst cancelled shows, aborted specials, truncated mini-series and promises of a better fall, it is interesting to note that nearly every new science-fiction production offered in 77-78 failed to ensnare the interests of the audience. In fact, the *only* weekly show to successfully capture science-fiction's unique sense of wonder was a fairly unheralded straight science offering. While the network brass beat their drums merrily for the likes of *Logan's Run* and *The Man From Atlantis*, the Public Broadcasting System's *Nova* quietly was garnering an increasingly large viewing public.

Nova is an SF-enthusiast's dream-come-true, a virtual institution on PBS. Now in its fifth year, the sixty-minute science series has won a horde of awards for its efforts in bringing visions of the past, present and future to its viewers in both an entertaining and informative way. Of late, however, the show has outdone itself in terms of appealing to the more futuristic inclined minds in videoland. Earlier this season, their two-part episode "One Small Step" and "The Final Frontier" won over a lot of

Photo: © NET



Top of page: Dirk Benedict and Richard Hatch of *Galactica*, now being called *Earth Star* at ABC. Right: NET's *Dracula*.

SF fans with its presentation of the history of the U.S. space program thus far and a scenario for things to come. *Nova* went into great detail explaining the prospect of colonies in outer space and mining camps on the Moon.

It was last March, however, that executive producer John Angier completely bowled over science-fiction fanatics during *Nova*'s dramatization of the current debate concerning computer intelligence. Should computers be endowed with "artificial intelligence?" Should they be as smart, or smarter than man? "Our image of machine intelligence comes from Hollywood," producer Paula Apsel told the press. "No one knows yet what a computer capable of reasoning like a human being would look like." To help examine the issue, *Nova* invited a host of concerned individuals onto its screen. Author Arthur C. Clarke, anti-artificial intelligence scientist Dr. Joseph Weizenbaum, R2D2, C3PO and *2001*'s Hal all took part in the debate.

For any science-fiction/science-fact buffs who haven't as yet discovered the PBS series, there are still several episodes to be aired before *Nova* enters its summer re-run phase. One hour will deal with the amazing phenomenon of desertification (much of the globe's wilderness is gradually becoming part of an ever-growing desert) and another with the problem of insect control (do pesticides create more problems than they solve?). Also on tape is an episode entitled "The Light Of The 21st Century," detailing the current status of laser light and its possible applications in everyday life and industry after the year 2,000 and a show called "Across The Silence Barrier," wherein the world of America's one million deaf citizens is examined. What is it like to exist in a world where hearing and language is taken for granted?

And that's just the tip of the iceberg. With *Nova*'s audience growing and the world becoming more and more interested in both fanciful and practical applications of technology, there are literally no boundaries for the show. The fall season looks to be even more exciting for *Nova*, the *only* science-fact series currently on the tube.

GALACTICA: On the home front, ABC-TV is expecting great things from this month's three-hour airing of the initial installment of *Galactica*. Producer John (*Star Wars*) Dykstra is responsible

for the visual effects and Executive Producer Glen Larson penned the script concerning the adventures of a group of space pioneers rocketing across the galaxy, planet-hopping in an attempt to seek refuge from the pursuing enemy forces of the Federation. Lorne Greene is cast as the Commander. Richard Colla directed. Two more episodes of the tentative series are planned for future showings.

BRITISH IMPORTS: Ever since *The Avengers* first made a dent on American audiences a decade ago, networks have been interested in importing the occasional British television series every so often to help them out of a tight spot. During the past few years, such syndicated offerings as *Space: 1999* and *UFO* as well as such PBS series as *Monty Python's Flying Circus* have proven themselves ratings savers. At present, there are a lot of British TV-ers up for grabs. All that is needed is an interested network to shove them onto the air.

One of the most impressive shows waiting in the wings is the BBC's *Dr. Who*. Time-Life Television has imported 98 half-hour episodes of this colorful British SF mainstay (on the air for ten years), starring Tom Baker as the equally colorful Dr. Who. The Doctor is a Time Lord, a being from a distant planet, whose physical and mental capacities far surpass those of an Earthman. The Time Lords have developed to the stage where they feel a responsibility for planets less able to look after themselves, and they hardly ever miss a trick within their own galaxy . . . watching from the splendid isolation of their own almost-perfect world. But the Doctor finds perfection dull and hops into his time-traveling Tardis machine week after week, finding new worlds (and creatures) to help and/or overcome.

Other British imports currently (or soon to be) up for stateside grabs include *Blake's Seven*, a 13-part science-

(Continued on page 64)



Art: Mark Fisher

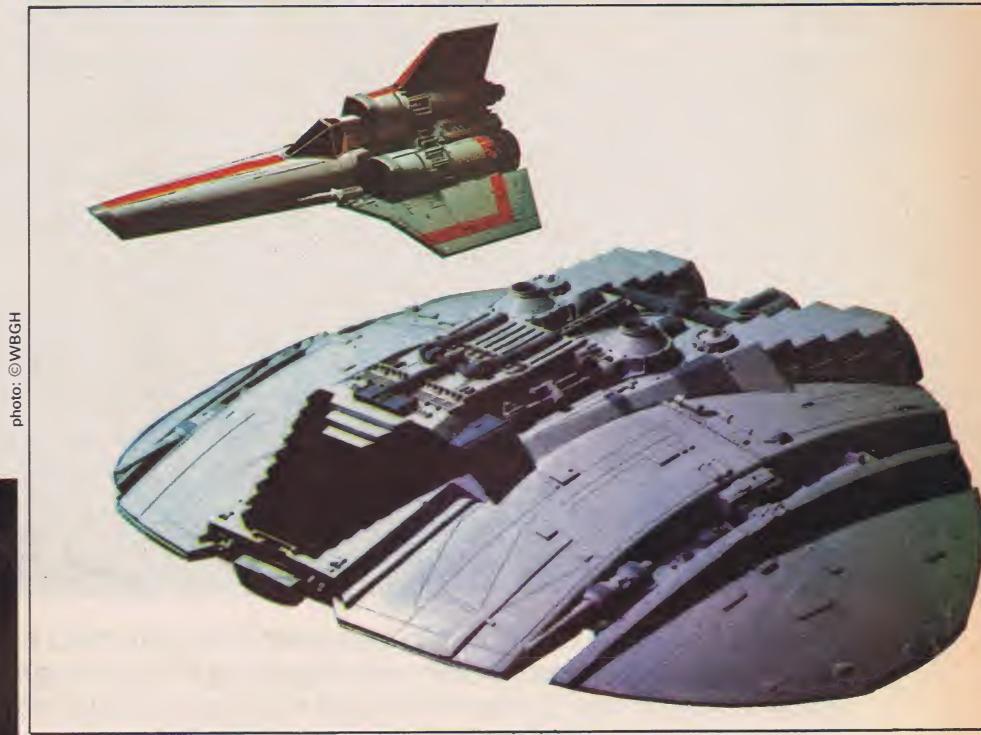
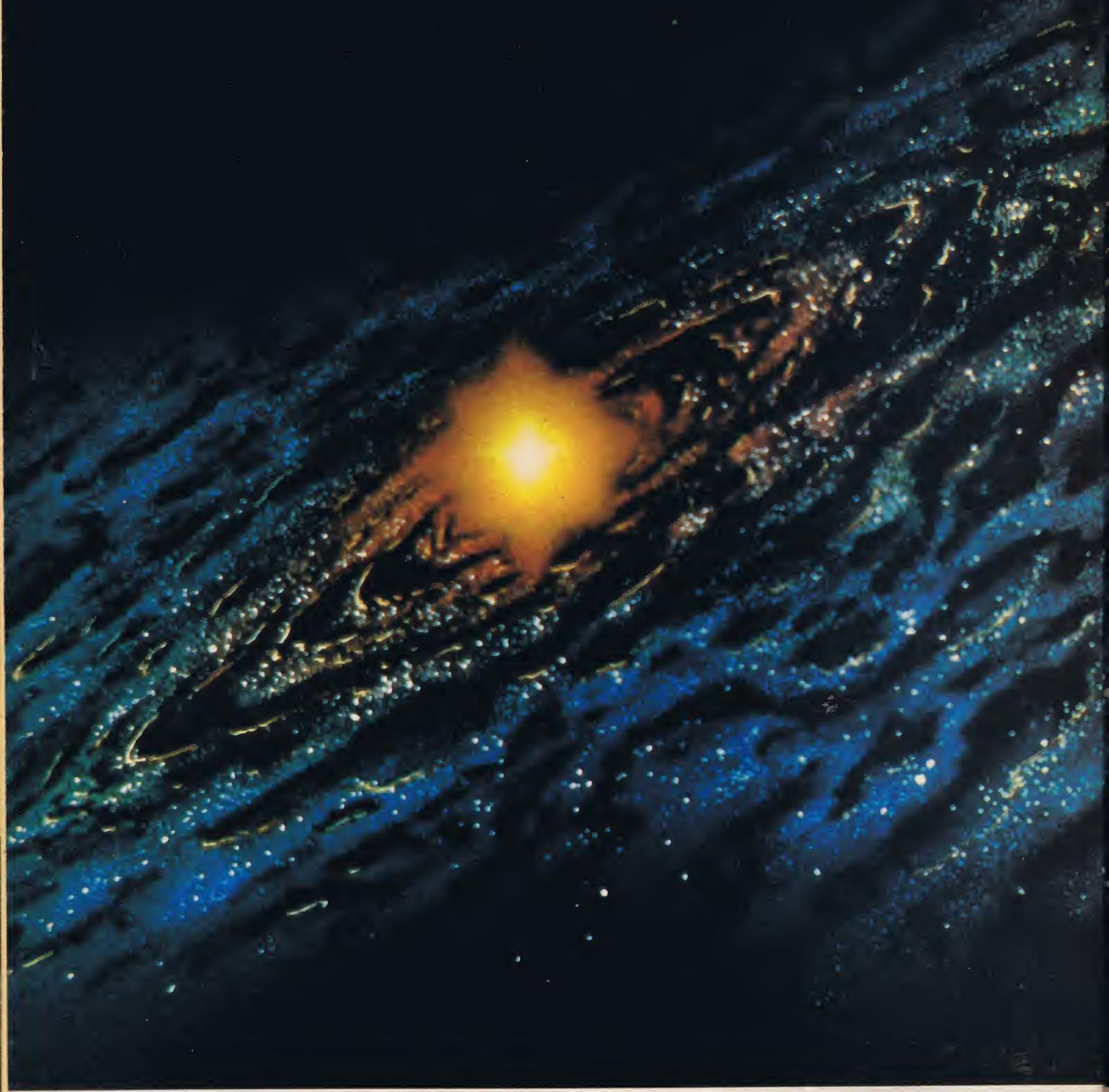


photo: ©WBGH



photo: © 20th Century Fox

Top of page: It's man vs. machine in *Nova's* episode on artificial intelligence. Above: Two of *Earth Star's* fleet of spaceships. ABC still is undecided whether to call the finished three hour pilot *Galactica* or not. Left: two familiar faces taking the pro-robot point of view on *Nova's* debate concerning the amount of intelligence computers should be allowed to possess.



There is a delicate relationship between the birth and the 'death' of a star. As a star dies, its mass undergoes violent change until it is no longer recognizably matter-as we know it. And there is more than one way for a star to 'die.' Through the use of radio astronomy we are learning about the possible nature of such phenomena as . . .

Quasars, Pulsars,



Art: Don Dixon

The awesome power of the distant quasar remains a mystery to today's astronomers.

By DIETRICK THOMSEN

Every 1.3372795 seconds. That was the period of the repeating pattern of radio waves that turned up in the records of a special radio telescope belonging to Cambridge University in England. The waves were pinpointed, emanating from somewhere between the stars Vega and Altair, in the Crab Nebula. Jocelyn Bell, who was the first astronomer to notice the repeating bursts among the other noises in the record, relates that the first suggestion about what might be causing these repeated signals was LGMs—"Little Green Men." But she, her teacher, Antony Hewish, and other members of their observing group soon dropped that idea.

In the first place, it soon became clear that if any aliens were working the switch, they weren't using energy very intelligently. The repeating signals represented a very extravagant use of energy, 10 billion times the total power that could be produced on Earth. And then, extended observation showed that the repetitions weren't as exact as they had seemed at first. And that didn't seem intelligent at all.

So the observers decided that a natural, non-LGM explanation had to be sought for the new-found phenomenon, which they named a pulsar. The natural explanation that has become widely accepted among astronomers (for the more than one hundred pulsars that have been found in the ten years since Bell noticed the first one) is one of the first things that Hewish suggested. A neutron star was the object emitting those fast radio pulses.

Astronomers dithered for some time before they began to accept the idea. It meant giving respectability to one of the physical theorists' wildest conceptions;

it was difficult for many to agree that there could actually be such things in the sky.

Once the camel had his nose in the tent, however, the rest of him came too. A few years after the radio pulses were discovered, pulsing X-ray sources were also found. To explain some of these, astrophysicists, emboldened perhaps by the credit given to neutron stars, invoked the neutron star's even weirder relative, the black hole.

In turn, these developments reacted with the theoretical picture of an older astronomical mystery, the quasar. The first quasars, or quasi-stellar objects, had been discovered in the early 1960s—years before the first pulsar. Quasars are objects that look like stars. However, they stand apart from any visible galaxies but radiate energy in amounts characteristic of whole galaxies, on the order of 10^{44} ergs per second. It had been clear since the beginning of quasar observations that some unusual mechanism had to be responsible for generating so much energy in such a small object (small by comparison to a galaxy). In recent years several astronomers have suggested that black holes lie at the heart of the quasar phenomenon. Indeed, it is now thought by some that every galaxy may have a black hole in its center.

At this moment in the history of astronomy, although the existence of neutron stars is fairly widely and calmly accepted, it is still highly controversial to suggest that black holes actually exist and that they may be responsible for pulsating X-ray sources or for quasars. Still, both concepts have gained a great deal of respectability in only a few

Dietrick Thomsen, a noted science writer, is also Senior Editor of Science News Magazine.

& Black Holes

Glossary

Black Hole: A super-collapsed object, a collapsed star emitting no light. An infinitely deep 'hole' in space, the existence of Black Holes can still be spoken of only theoretically, though evidence for the phenomena does exist.

Neutron: A neutron carries no electrical charge, and has a mass nearly equal to a proton, which carries a positive charge. Neutrons are present in every atomic nuclei, except for the hydrogen nucleus. Neutrons neither produce nor respond to any electromagnetic force.

Neutron Star: An incredibly dense star, formed by neutrons which are forced into close contact by gravitational collapse. Neutron Stars are formed by the rapid contraction of matter, probably following the burst of a Super Nova explosion.

Pulsar: Pulsars are thought to be pulsating stars, from which their name arises. Too faint to detect (up to now) outside our own galaxy, all pulsars send flashes of microwaves in a strict sequence (or periodicity). Nobody has ever 'seen' one, but their existence is posited through signals picked up by highly sensitive radio telescopes.

Quasar: A dim star, *quasi-stellar*: ergo, quasar. Billions of light-years away from us, quasars are thought to be receding from the center of our universe, the spot we think of as the scene of a primordial Big Bang. The size, rate of speed, composition, and density of quasars are all open to question. Their existence was first posited in the early 1960s.

Radio Telescope: The astronomers' most highly refined terrestrial tool. Telescopes designed to detect and pinpoint the rapid changes in microwave sources, and chart them in the universe. Pulsars were first discovered by radio telescope in 1967.

Spacetime: The combinant of space and time: the objective basis for any discussion of the universe.

Supernova: An extraordinarily large, extremely bright nova, or temporary (new) star. Sightings of Supernovas are rare—4 have been sighted in modern times: in 1054, 1572, 1604, and 1885. Located in distant galaxies millions of light-years away, they are thought to be formed by the tremendous explosions of massive stars.

White Dwarf: White-hot stars, and dwarfed in size by other stars (like our own Sun). White Dwarfs are thought to possess extraordinary density.



Photo: NASA

years. Astronomers and astrophysicists spend a good deal of time discussing neutron stars and black holes, arguing and working out their physical characteristics. Before Jocelyn Bell observed the first pulsar, neutron stars and black holes were curiosities of physical theory.

A Star Is Born, And Dies

Stars are born by gravitational collapse. At least that is the general belief at the moment. The space of our galaxy—and other galaxies—is filled with clouds of gas and dust. Astrophysicists believe that a star begins when such a cloud or part of it is disturbed in such a way that it starts to clump. Once a

The International Ultraviolet Explorer will monitor energy from the stars.

clump begins, its gravitational attraction draws more material, and a large amount of gas and dust begins to fall together under the influence of its own gravity. As things fall together friction heats them up until a temperature is reached at which atomic nuclei begin to fuse with each other.

The mature period of a star's life is characterized by continuous processes of nuclear fusion, which is the source of the energy radiated by a star and of the star's physical stability. The energy released by the fusion counteracts the

tendency toward further collapse, and a typical star maintains a given size for billions of years.

But the star is constantly burning up its own substance, so to speak. It starts out, mostly, as hydrogen and deuterium. After billions of years nearly all the hydrogen and deuterium in the star have been fused into heavier elements. At this point the production of energy begins to falter, and the star becomes unbalanced. The unbalance can lead to further collapse, and then the star becomes what's known as a white dwarf. A star that may be hundreds of thousands of miles in diameter *collapses* to a diameter of about ten miles or so and glows feebly from a cycle of nuclear reactions that use heavier elements such as carbon, nitrogen and oxygen as fuel.

Or the imbalance may result in the kind of explosion called a supernova. In the explosion the star's outer layers are blown away, and its core is crushed to something much smaller and denser than a white dwarf. That something may be either a neutron star or a black hole. A neutron star can be regarded as a giant atomic nucleus composed of billions of neutrons (and some surviving protons and other particles according to some detailed analyses) hanging in space.

Black Holes

A black hole is even stranger. It is an object so dense that its gravitational field is so strong that nothing that falls into it can escape. Neither matter nor light nor any kind of energy can get out of a black hole. It is thus effectively cut off from the universe, and it represents matter that has effectively fallen out of the universe.

Near a black hole spacetime is sharply curved, and nearer and nearer the center

of a black hole the curvature gets sharper and sharper until finally spacetime disappears down the drain. At the "singularity," which is the technical name for the center of the black hole, clocks stop and space vanishes. In one sense the singularity can be regarded as a way out of the universe, a kind of connection to other universes. Whether a dying star becomes a neutron star or a black hole depends generally on its mass.

So much for the theory. In the case of a radio pulsar the neutron-star theory seems to fit the facts well enough that most astronomers do not contest it loudly. Those who have studied the theory of neutron stars in detail say that an actual neutron star should be surrounded by an atmosphere of electrically-charged particles, electrons and protons, left over from the collapse. A neutron star ought to have a magnetic field, because most stars have magnetic fields, and there is nothing in the process of collapsing to a neutron star that should destroy the magnetism. The radio waves can come from this atmosphere if the neutron star has a magnetic field. Electrically charged particles moving under the influence of a magnetic field will generate radio waves. These waves will leave the neutron star along the directions of the magnetic poles. The neutron star's rotation will make this beam sweep around and around. When the beam crosses the line of sight from the Earth to the neutron star, Earth's radio telescopes receive a pulse of radiation.

The Dark Object

The case for the existence of black holes is much more controversial. It depends on the nature of the pulsating X-ray sources. Unlike radio pulsars, which are almost all single objects, the pulsing X-ray sources appear generally to be members of binary systems. A binary system is two objects bound together by gravity and rotating around their common center of gravity. In the case of the pulsing X-ray sources one member of the binary is a more or less ordinary star, and the other is a dark, extremely dense object. Theorists presume that the X-rays come from the dark object or the volume immediately around it.

The picture goes something like this: The two members of the binary system are orbiting so close to one another that the gravitational attraction of the dark condensed one draws a continuous stream of matter from the ordinary star. Since the ordinary star is rotating, the matter leaving it has a circular motion, and as it falls down onto the dark object—or into it if the dark object is a black hole—this matter forms a spiralling disk. Matter from the inner

edge of the disk is continually falling into the dark object. New matter is continually being added to the outer edge.

Within such a disk there is a great deal of friction. The friction tends to heat the disk, and the heated disk emits energy, in this case in the form of X-rays. The pulsations come about because of eclipses. As the two bodies revolve around each other, the ordinary star periodically eclipses the dark one and its attendant, X-ray emitting disk. So the X-rays are repeatedly cut off and arrive at Earth in regular pulses.

So far so good, but we have not defined the nature of the dark object. It is generally accepted that the object has to be some form of collapsed or condensed star. If it were a white dwarf, we should see it unless it was extremely dim. The likely candidates are neutron stars and black holes. Which one is likely in the case of a given X-ray emitting binary system depends on the mass of the dark partner. If the dark member is more massive than a certain limit, it should be a black hole. Less mass means that its collapse should have stopped at the neutron star state. Theorists argue over exactly what the limit should be, but it is about a few times the mass of the Sun.

There are ways to determine the masses of members of a binary star system. They depend on an accurate determination of the orbit of the system and a knowledge of what kind of star one of them—in these cases it would be the visible one—is. The latest astronomical satellite, the first High Energy Astronomical Observatory, is capable of X-ray observations. It has surveyed some of the pulsing X-ray sources that are candidates for black hole status, notably the sources Circinus X-1 and Cygnus X-1, and there is a hope that HEAO-1 may provide accurate enough observations to settle the argument over whether any of them is really a black hole.

Quasars

Though the question of whether there really are black holes in the sky has not yet been answered, their promotion from theoretical speculation to possible observational reality has influenced the theory of quasars. Several recent theories take off from an analogy to the black-hole theory of pulsating X-ray sources.

When quasars were first discovered in the early 1960s, astrophysicists realized that some unusual and highly efficient process must be responsible for their almost incredible rate of energy production. It was suggested then that gravitational collapse, the infalling of matter under the influence of its own gravity, was the only energy conversion mechanism efficient enough to do it.

The latest theories propose that there is a black hole at the center of that collapse. Like the black hole in the X-ray source, this one would be surrounded by a disk, or more likely a sphere, of infalling matter. The energy generated by the falling of the matter would be converted into heat by friction and would be radiated away as the light and energy we observe from the quasar.

In addition to their possibly strange physics, quasars are odd objects from an evolutionary point of view. They are not galaxies, but they are not stars, either. They are not inside galaxies, but apart from galaxies, yet their energy production is equal to that of galaxies.

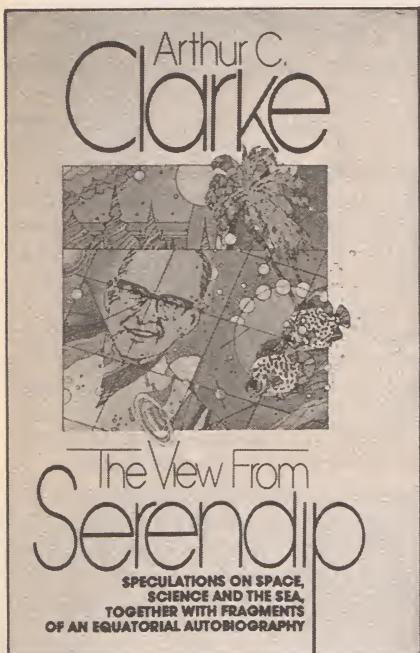
These facts have led a number of astronomers to propose that there is an evolutionary connection between quasars and galaxies, specifically between quasars and the centers of galaxies. The centers of galaxies tend to be strong sources of radio and infrared waves. The suggestion is that the centers of galaxies, especially the centers of bright active galaxies, such as Seyfert galaxies, are basically the same phenomenon as quasars.

In this view quasars can be galactic centers that never developed galaxies; they can be galactic centers whose galaxies are too faint for us to see, or they can be galactic centers that are too young to have developed galaxies. The last possibility is especially plausible because quasars are the most distant and therefore also the youngest objects we can see in the universe. Some of them are upwards of ten billion light-years away, and therefore we are seeing what they looked like that many years ago. They thus give us a glimpse of how things were in the early days of the universe as well as a glimpse of its outer edges. Cosmologists hope to learn much about both the history and the geometry of the universe from them.

But suppose that quasars and galactic centers are related and that black holes are at the centers of them. What about our own galaxy? In the center of our galaxy (and others) there would be a giant black hole surrounded by a dense sphere of matter attracted by its gravity. It would be continually swallowing this matter, including whole stars, from time to time. The sphere would emit a lot of radiation in light, X-rays and other parts of the spectrum.

We cannot see the center of our galaxy. It is obscured by dust. But we do know that there is a strong source of radio and infrared there. So maybe there is a giant black hole there.

It would be a fitting subject for science fiction: The giant mouth in the center of the galaxy. The things that might happen to a starship that fell down it are fascinating, but there is not room to deal with them here.



The View From Serendip by Arthur C. Clarke (\$8.95 in hardcover from Random House)

Arthur C. Clarke's latest book is subtitled "Speculations on Space, Science and the Sea, Together With Fragments of an Equatorial Autobiography"—which calls for a bit of explanation.

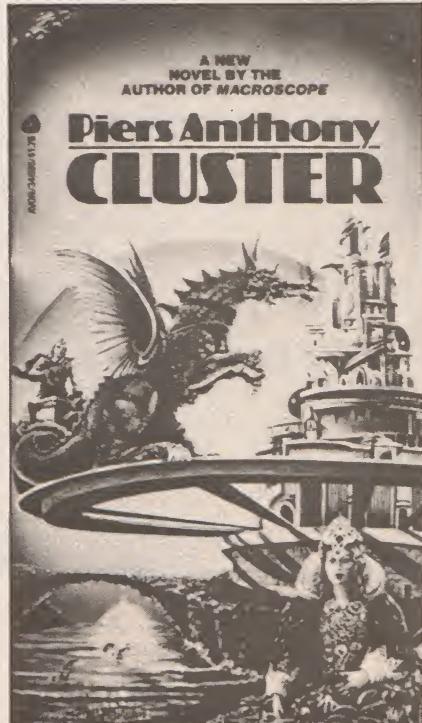
"Serendip" is an ancient name for the equatorial country of Ceylon, the indigenous name for which is Sri Lanka: The place that Clarke has called home for the past twenty years. The book is a strange hybrid, combining newly written personal reminiscences with reprinted articles from a variety of times and places. In toto, the volume is not so much a chronicling of Clarke's life as it is a statement of his ideals, goals and the fire that burns in his soul. There is, however, a wealth of personal history to be gleaned. In fact, this is one of the most readable, personable, fascinating and compelling looks into one's life that I've come across in a long while.

Arthur takes the reader into his Sri Lanka home and traces—with some hilarious anecdotes—his life in that tropical wonderland. Most of the essays and reprinted articles are Clarke's "speculations on Space, Science and the Sea." Many first appeared in limited circulation publications; some are lectures or addresses given to an interesting variety of organizations. No matter when they were written or spoken or for whom they were meant, all are good reading and of contemporary value.

A partial listing of the chapter titles is as revealing as it is intriguing: Dawn of the Space Age; Servant Problem—Oriental Style; The Scent of Treasure (Arthur's first-hand account of finding sunken treasure off the barrier reefs); The Next Twenty Years; Mars and the Mind of Man; Introducing Isaac Asimov; Life in Space; Technology and the Limits of Knowledge; Willy and Chesley (referring to Ley and Bonestell, respectively).

Clarke is not afraid to let his ego or his vulnerabilities shine through his glorious prose and not-so-subtle British wit. *The View From Serendip* is a celebration of a man's life and the life of Man. I strongly recommend it to anyone who is even remotely familiar with this most extraordinary person—"the world's best science fact writer" (a title agreed to in the Clarke/Asimov treaty of peace).

—Howard Zimmerman



Cluster by Piers Anthony (\$1.95 in paperback from Avon Books)

The book cover says it all: "Flint of Outworld has come!" And his arrival brings fresh air to the lists of original SF novels. Flint is a worthy companion to Anthony's other memorable heroes, *Sos the Rope*, *Var the Stick*, *Neg the Sword*—now collected in one volume, *Battle Circle*, also from Avon Books—the pro-

tagonists of *Macroscopic*, and the intrepid adventurers in his other trilogy, *Orn*, *Omnivore*, and *Ox*.

Cluster, too, is the first book of a trilogy, but this should not deter you from reading and enjoying it. Except for a two-page epilogue, it stands alone as a well-researched, well-written, and finally, effective novel. If the remaining two works, *Chaining the Lady* and *Kirlian Quest*, are as good as this one, Anthony could probably consider himself permanently established among the ranks of science-fiction's best.

The novel gives new meaning to "close encounters" since the basic interaction between man and alien is integral to the theme. It seems that the Andromeda Galaxy is draining energy from the Milky Way to solve its own technological problems, weakening the atomic forces that hold matter together—a move that would eventually incur total destruction to our galaxy.

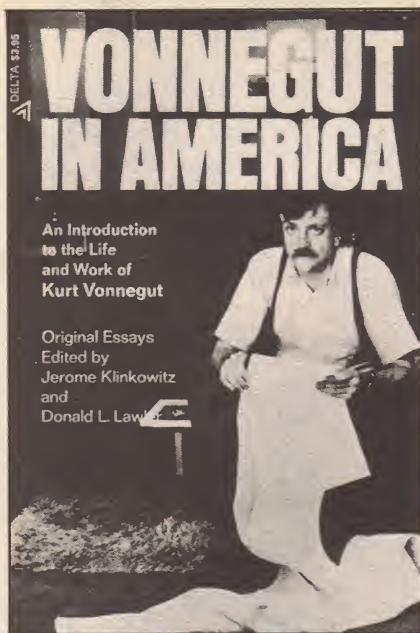
To combat this threat, the planets of our galaxy attempt to band together, using the secret of "Transfer," the ability of one mind to inhabit the body of another over a great distance. But to effect this transferral the individual's Kirlian field must be extremely high. In the Sol system, Earth's own, the highest Kirlian field, over 200, is possessed by one Flint of Outworld—who just happens to live on a stone-age planet, can't read, walks around naked, and has green skin.

The Ministers of the Imperial Earth Council figure it would be like asking The Incredible Hulk to fill James Bond's shoes. But Flint, once contacted, is apt for the job. It does not really matter how he looks, because, in the course of the book, he inhabits no fewer than four alien creatures, each as detailed and astonishing as the next.

Anthony develops every episode to the degree that not only are the aliens different and interesting to the human mind, but they maintain their own characters outside of the human realm. Being a long-time reader of SF I thought I would grow bored with "just another galaxy in danger of annihilation" book, but *Cluster* kept me smiling all the way through, appreciating the concept, the style, and the construction.

Anthony is not only readable, he's entertaining as all get out. My only possible complaint was that Avon didn't publish all three books at once. After a few hours with Flint, I can't wait to meet his relatives.

—Richard Meyers

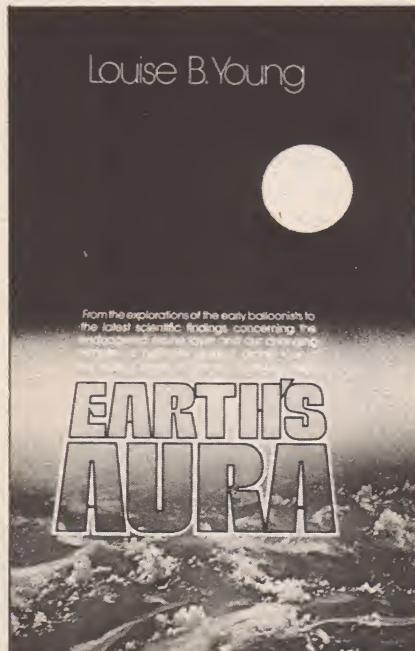


Vonnegut in America, Edited by Jerome Klinkowitz and Donald L. Lawler (\$3.95 in paperback from Delta Books)

Scholarly jaunts into literary criticism are always fun to read. It's truly fascinating to see how the most interesting of topics can be pounded into a devastatingly tedious pulp. For that reason, master satirist/novelist Kurt Vonnegut Jr. would probably enjoy the deadpanned treatment accorded him in *Vonnegut In America*, a collection of original essays penned by self-proclaimed Vonnegut experts. Between the covers, both Vonnegut's life and work are dissected. He is discussed as a science-fiction writer, a dissident, a satirist, a mainstream novelist, a money-inspired author, a purveyor of elaborate shaggy dog stories, a kindred spirit of Nabokov's (*Lolita*) and an academic figure. Identical source material is used repeatedly with key phrases quoted to the point of extinction. *Vonnegut In America* is the type of professorial knee-jerk exercise that one learns to abhor during one's college years but recalls with a fond sense of nostalgia on one's deathbed. The book's austere amorphousness actually pays a backhanded compliment to the art of Vonnegut. In essence, Vonnegut is one of the few authors alive who *defies* accurate description. His work simply *refuses* to be categorized. The SF overtones of *The Sirens of Titan*, for instance, just cannot be compared to the autobiographical angst of *Breakfast of Champions*. The omniscient loneliness portrayed in *God Bless You, Mr. Rosewater* simply does not prepare a reader for the surreal sitcom situations of *Happy Birthday, Wanda June*. Vonnegut is an author in a constant state of flux,

pointing out, in his own unique way, the total insanity of today's "logical" lifestyle. If you haven't as yet encountered Vonnegut's fiction, by all means plunge into his paperbacks post-haste. If you've totally immersed yourself in Vonnegutia up to your eyeballs, then promptly scan *Vonnegut In America*. Experiencing this book is like watching a wizened theologian attempting to count the number of angels dancing on a pin using a pocket calculator. You realize his task is utterly impossible, but ya gotta admire his spunk.

—Ed Nahas



Earth's Aura by Louise B. Young
(\$12.95 in hardcover from Alfred A. Knopf)

Alleged to be a book of science fact, *Earth's Aura* is, in reality, a cosmic paean; a song of praise dedicated to the part of the world we live in: the atmosphere. With loving accuracy, author Louise Young explores the powerful yet amazingly delicate nature of this nourishing and protective layer which encircles our Earth. She traces man's exploration of the aura from the early days of hot air balloons to the coming of the SST, portraying both the beneficial and detrimental results of these encounters between man and nature. For example, glider pilots float into seemingly harmless rotor clouds only to have their planes torn apart by violent winds. And jet streams, then an almost unknown phenomenon, were used by the Japanese to launch a successful incendiary balloon attack on the United States during World War II. An attack launched from Japan itself! In another case, two early balloonists are sucked upward by a thunderstorm, miraculously emerging

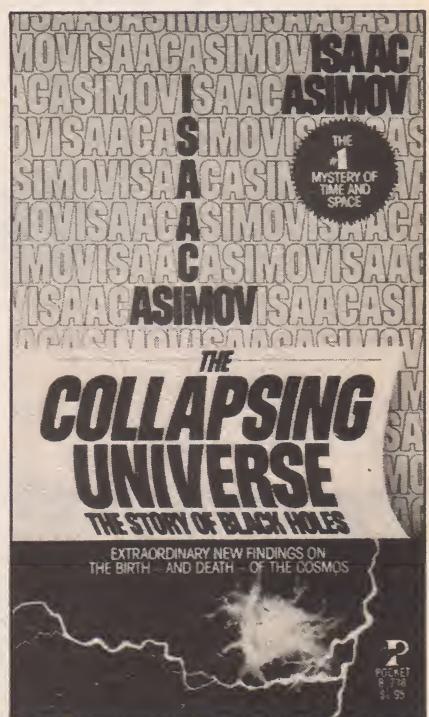
above it at an altitude of over 30,000 feet!

Such is the power of Earth's aura, and Ms. Young examines it thoroughly; tracing the origins and development of such atmospheric traits as wind, clouds, rain, snow, waves, hurricanes, tornadoes and jet streams. Turning her attention to the present day plight of our atmosphere, she then examines *Man's* aura and the ultimate effect that his chemicals, ultra-tall cities, pollution and spray cans may have on the world around us. Will the ozone layer survive Man's interference? Will the seasons be altered by architectural design? How will the delicate halo of atmosphere surrounding the Earth cope with Man's exploration of space?

Earth's Aura is a vivid reflection of today's world and, as such, is both beautiful and frightening. Louise B. Young successfully paints a stirring portrait of the intrinsic majesty of nature . . . a portrait that Man can choose to either cherish or obliterate.

—E.N.

P.S. This book might be interesting to
"Woman" too.



The Collapsing Universe by Isaac Asimov
(\$1.95 in paperback from Pocket Books)

There is little doubt that today, the ancient myths used by 'primitive' people to explain the nature of their universe (and their place within it) are all but dead. These myths were profound 'centering' devices and it has been suggested that, in their passing, modern people have all but lost their *own* centers. What do we have to replace these stories and

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The composer is Ferde Grofe, best known for his "Grand Canyon Suite" and other American music classics.

The album, a limited pressing (not mass-distributed to record shops!) includes photos and background notes on the movie, the composer, the recording of the music and the discovery and salvaging of this historic soundtrack. "Rocketship X-M" is a "must" for science-fiction fans and record collectors!

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legends? What body of knowledge might yield a similar understanding of the nature, origin, and depth of our universe, and our own place within it?

Some say that Science—hard and cold—is becoming our new mythology; Science, rather than opposing traditional religious belief, has *become* the new belief, and its new elements have become Myth. At least where the planets are concerned, Science already functions as Myth—it explains our universe—in exhilarating, phantasmagorical terms. Black Holes, White Dwarfs, Pulsars, Charm: can we find in these words the beginnings of a new mythological genesis?

Who better than Isaac Asimov—that protean creator—to ask this question, and to write the most accessible, adventurous, and *juicy* book to date on the birth and death of the heavenly bodies that make our universe. Abundant in modern cosmological origin theory, Asimov's 1977 book (recently re-issued by Pocket Books in paperback) is probably the single best introduction to the birthing and death of the stars to date.

Of course, with a body of theoretical knowledge so large, and with so much of the theory still up in the air (sic)—one can only speculate. But Asimov *the explainer* triumphs easily over Asimov the cautious scientist and the results, in *The Collapsing Universe*, are a grand relief from the obscure, academic swill so prevalent in the field of astrophysics. For example, rather than debate the fine points of cosmic creation, Asimov lets the reader know that of course there was a Big Bang that turned the universe on an outward-bound course. And *naturally*, there is a finite limit to that outward movement, an end if not in sight than certainly in theory, that will certainly be reached someday. And what will happen then? The heavenly bodies will come back, will collapse, towards their point of origin, drawn in by the same forces of gravity that propelled them outwards in the first instance. There: in four sentences, we have covered the entire thrust of Asimov's book—a sum total of theoretical cosmology in this century. Of course, Asimov delineates the matter far more carefully and in greater detail than suggested here, letting the reader in on the problems posed by each link on the theoretical chain leading to this conclusion.

Here, implied, is the drift of the cosmos for incredible eons to come, a lovely, poetic ebb and flow. Imagine a book on that subject, dissecting the delicate theoretical minutiae, but always towards a clarity of vision, a concrete understanding of our universe and our own planet's place within it. It is a strange interface, Science and Myth, but Asimov achieves it.

—James C. Odell



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sf graphics

Each issue of *FUTURE* will examine the world of advertising and promotional graphics. The talented people who sell science fiction to the public by adding reality and excitement to numerous products have remained invisible for long enough. Their work will find a proper showcase in this regular feature.

By CHARLES BOGLE

The Fifth Millenium is a time of darkness. All music has disappeared from the cosmos. Peace is passe and constant warfare is the sole activity that keeps the residents of the Known Worlds from total ennui. Only the soothing musical strains of the Thalin Matter Converter can restore order to the heavens. A group of kind-hearted brigands, the Astral Pirates, blast-off to rescue the scientific godsend from the hands of the thieving Kleptoies. Led by their intrepid leader Althal, the Pirates battle the Mandarin Warlords, the evil Fornax and the Heavy Metal Monster Machine before ensnaring the music-giving device. Bearing an intergalactic message of good will, the pirates head for home and the dawn of a new era of universal brotherhood.

The saga of Althal and his crew sounds like a science-fiction film fanatic's dream-come-true. It offers everything a movie could hope to: adventure, romance, action and rampant idealism. The Astral Pirates' space yarn appears to be the perfect addition to the current wave of science-fiction screen thrillers. Well, unbeknownst to a lot of movie buffs, the film has already been

released! To make matters more mysterious, no one will ever see it in a theater.

The Adventures Of The Astral Pirates is, according to creator Lenny White, "the greatest movie on wax." To say the very least, it is a *different* kind of motion picture. There are no actors involved. No special effects. No directors. No bizarre camera angles. In essence, there is no movie! *The Adventures Of The Astral Pirates* is a new long-playing record.

The innovative disc is a two-sided excursion into SF jazz-rock composed by drummer White and beautifully envisioned graphically by fantasy illustrator Mike Kaluta. Packaged opulently in an album jacket featuring both a full-color reproduction of the pirates in battle and a comic bookish insert recounting the entire plot in both narrative and picture form, *Pirates* is a rock and roll first—an excursion into sight and sound that Lenny dubs "an audio film."

Last year, Lenny, a science-fiction fan since childhood, decided that the time was right to do something different

To illustrate Lenny white's SF disc adventure, Mike Kaluta created this dramatic storyboard for the LP.



Lenny White



After stealing the Thalin Matter Converter, the Pirates are pursued by the Mandarins.



In a strange pyramid the two opposing forces plan a showdown.



The Pirates and the Warlords crash on an asteroid, the Converter is lost in the process.



An alien machine plays music which lulls the fighters into total harmony.



The image of Fornax, the creator of the Heavy Metal Monster disrupts the lovefest.

in both the realm of SF and the world of music. "In the past," he says, "I've done bits of science fiction on some of my albums. *Venusian Summer*, for instance, had a piece of music that was dedicated to the crew of the Starship *Enterprise*. When it came to doing this album, I decided, 'why just go half way?'"

So drummer Lenny decided to create the first SF film on record. Taking his *Space Pirates* idea to Elektra/Asylum Records executive Don Mizell, Lenny worked in tandem with the jazz enthusiast in rounding out the concept. Novelist Michael Bryant was then brought in to flesh out the plot. "It was a 50-50 composition," Lenny explains. "Some of the music was written before the narrative and some of it was inspired by specific written scenes."

White was aware that constructing a "sound" movie would be a difficult task, but found that once the *Astral Pirates* project was underway, the melodious plot developed easily. "Some of the music just conjured up pictures for me," he says. "I'd listen to a piece and I'd say 'yeah, that sounds like a spaceship.' The whole idea was interest-

want to put up with that on *Astral Pirates*, so I actually put what I wanted people to hear on the album jacket. Have it there so people could read and listen at the same time. I'm into visual science fiction. I collect SF films and memorabilia. I've loved DC comics since I was a kid."

Lenny thought that the visual end of his album should be illustrated in a kinetic, adventurous style harkening back to the golden age of science-fiction illustration. Finding an artist to actually portray the jazzy scenes, however, proved a difficult task. Lenny, an East



The Pirates and the Mandarin Warlords embrace in this vision of Universal peace and love.



Fighting the love vibrations, Fornax summons his Heavy Metal Monster Machine.

sense of the word. I *only* do things for the *love* of it. I guess that can give you a reputation for being hard to deal with," he laughs, "but if I don't want to do something . . ."

Kaluta, based in New York, met several times with Lenny and ironed out whatever initial conceptual problems arose. "They had their own ideas on the project," he explains. "It made it difficult for me at first, I had to take someone else's visualization and tie myself into it. We tried the cover a couple of times before we reached an



The Pirates and Mandarins attack Fornax. A battle of good vs. evil ensues.



Fornax's evil memories are battled by the Pirates with visions of a pastoral Earth.



New York artist Mike Kaluta created the *Astral Pirates* cover in record time.

ing. Many times in the past, people have recorded albums and have done tunes thinking 'now this is going to represent a man walking down a snowy street.' They'd play it for someone and the listener wouldn't really catch on. The artist would have to tell the audience what he was trying to say and then have the listener say 'Now I get it. You're right, it *does* sound like that.' I didn't

agreement on the skull rocket. I tried making it a little more African. A pulsar ring on the back was originally planned, but we dropped that. Finally, we agreed on a design but I souped it up a little bit. I put on those two spikes on the front of the ship, instead of vanes."

Once Lenny approved Mike's design, the rush was on to meet the impending album's deadline. "Once the design was approved," Mike says, "I had to talk to the West Coast about it every two days. I worked a solid week on it, getting about three hours of sleep a day. The painting was sent off barely dry. I was



Althal communicates his love to the Heavy Metal Machine, which turns on Fornax.

working with oil, too, which meant I had to work in my studio instead of home. It was freezing in there. And the deadline was pretty outrageous. I didn't even have time to do the color on the inside illustrations. I would have loved to but I just couldn't get it done. They had someone else on the West Coast do it."

Despite the frantic pace, Mike came up with a series of stirring science-fiction scenes that bowled over both Lenny and the record company. Four weeks after Kaluta handed in the finished artwork, the *Adventures Of The Astral Pirates* was rushed onto the record racks for all SF-rock fans to both see and hear. For Lenny and Mike, their joint experiment has proven to be a springboard for their burgeoning interests in SF. "I'd love to do more album covers," Kaluta says with a hint of caution. "But, next time, I'd like the company to come to me first so I can come up with some original sketches."

As for Lenny White, he aspires to get into the visual realm of science-fiction and fantasy in a more meaningful capacity. "I'd love to have the *Astral Pirates* done as a full-length cartoon, animated like *Fantasia*. I've sent some of the music to Ralph Bakshi. I know he's doing *Lord Of The Rings*. I'd like to do the music for that, too. Who knows? Maybe someone at some studio will pick up on the *Astral Pirates* and film it. I hope so." Lenny pauses for a moment before adding as an afterthought, "I've been into science-fiction for a long, long time."



Quest Beyond The Stars: Are We Alone?

Photo: NASA



"It is both timely and feasible to begin a serious search for extraterrestrial intelligence."

This quotation from a recently released NASA report is one of the major conclusions of a feasibility study on the Search for Extraterrestrial Intelligence (SETI), supported by a committee of distinguished scientists headed by Philip Morrison, a noted physicist at the Massachusetts Institute of Technology (MIT). The report proposes a seven-year program of progressive radio search for other civilizations in the universe, based on present

Jesco von Puttkamer is Program Manager of Space Industrialization and Integrated Long Range Planning Studies at NASA. He is also the science advisor for Paramount's forthcoming Star Trek movie.

Project Cyclops hopes to detect signals from extraterrestrial civilizations.

day detection equipment. If there are radio signals coming toward our solar system from intelligent and communicative creatures in space, sooner or later a program like SETI should detect them.

The dream of communicating with species other than humans is one of the

oldest of mankind. From the childhood enchantment of Dr. Doolittle to today's wondrous explorations into communication with primates and dolphins, and to the speculations and fantasies of science fiction, in which the notion of contact with extraterrestrial intelligence is solidly (and, lately, lucratively) entrenched, humans have always found great excitement and, yes, hope in the idea of exchanging knowledge with beings other than themselves—be it as a teacher of a less developed or a student of a more advanced species. Now, with the new revolution in scientific thinking regarding the plenitude of other planetary systems and the frequency of occurrence for intelligent life in the universe¹, science is seriously gearing up

In FUTURE No. 2 Science Notebook page 68, the last sentence of the next to the last paragraph in the second column should read: "The overall estimate is obtained by multiplying the many conditional probabilities of these outcomes, but there is a catch: in multiplying possible goofs in our estimates, and so the likelihood of deriving a good judgement decreases as we proceed."

The third paragraph on page 69, first column should read: "With 200 billion suns in our galaxy, of which the oldest are about 12-18 billion years old"

And, finally, the fifth paragraph of column two page 69 should read: "Or—worst of all—the answer may be the lack of longevity of civilizations."

ERRATA

1. See FUTURE No. 2, Science Notebook, "Extraterrestrial Life: Where is Everybody".

to tackle the problem of seeking other civilizations in space, saying, in effect, "We are not alone."

The idea of establishing radio contact with interstellar races by first searching for microwave signals using radio astronomy technology was introduced to the scientific community in 1959 by Morrison and another physicist, Giuseppe Cocconi, in *Nature* magazine. One year later, the radio astronomer Frank Drake pointed a 27 meter antenna for about four weeks at two nearby stars, Epsilon Eridani and Tau Ceti (both about 11 light-years distant), searching for signs of intelligence. Named *Project Ozma*, this pioneering first attempt at SETI failed to detect signals, though—which isn't too surprising in view of the brief, almost cursory nature of the search. Since then, there have been other modestly financed searches at Greenbank (W.Va.), Arecibo (Puerto Rico), in Canada and particularly in the Soviet Union. But the number of stars examined so far is less than 1/10th percent of the number that would have to be investigated to stand a reasonable statistical chance for discovering another civilization.

As I noted in the preceding issue of *FUTURE*, the Milky Way galaxy may, in this instant, be the home of as many as one million civilizations at or beyond mankind's present level of development². With 200 billion potentially suitable stars in the galaxy, there is a chance of 1 in 200,000 for each star to harbor one or more planets, and as many stars would have to be examined one by one. Less than 200 have been, so far.

There are at least three billion other galaxies in the observable universe, strewn through billions and billions of light-years. All of them may be cradles of life forms and intelligent races — billions of them. But the distance between us and them makes it highly unlikely that we'll ever receive signals other than from some hypothetical ultra-civilization that is so far advanced beyond our level of development that its manifestations may appear to us as "cosmic wonders," caused by gods. To engage in radio communications with such far distant races of beings is out of the question. A two-way radio signal to even the galaxies closest to Earth, the Magellanic Clouds (at 200,000 light-years) and M31 in Andromeda (1.8 million light-years), would require 400,000 years and 3.6 million years, respectively.

Within our own Galaxy, too, distances beyond 1000 light-years will make two-way exchange unlikely. Civ-

ilizations are probably interested in microwave radio communications only for limited time. By the time the receiving race has answered the signal (more than 2000 years later) the super-civilization would most likely have passed on to an advanced state beyond the communicative phase. Our main interest, at first, will, therefore, be with regions in space not over 1000 light-years away.

Star distribution varies widely throughout the flattened disk (nucleus and halo of our galaxy), which measures 100,000 light-years in diameter³, but the average separation between stars in the neighborhood of our Sun is about 7 LY (i.e., one star in about 10³ cubic parsecs or 346 cubic light-years). In a volume with 1000 LY radius around the Sun, therefore, there are sprinkled about 10 to 12 million stars. Assuming one third of them to be on the Main Sequence of the Hertzsprung-Russell diagram, thus having the "right" age, and half of these to be binary or multiple stars, of which only 10% may be suitable for a planet, we are left with 2.2 million suns which may have at least one planet with life.

Assuming further that one million super-civilizations are randomly distributed in the Galaxy, there should be about 55 of them within 1000 LY from Earth. If all of them are radiating signals at us, we must investigate 40,000 stars to have a fair statistical chance of detecting a single extraterrestrial message—but the probability of being successful would still be only 63%. To raise our chance to 95%, the number of stars to be checked increases to 120,000. But, if only 20 of the 55 civilizations are transmitting, it would have to be 330,000 stars.

Supercivilizations may be "talking" to each other across cosmic distances, but unless their communication-beam is tightly bundled and Earth—on an extremely improbable chance, happens to come into the line-of-sight, we could not hope to detect other races by the "leakage" from their routine radio chatter at the longer distances.

But, if "they" are the kind of creatures who (like humans) need and enjoy communicating, we could expect them to set up a beacon transmitting "call" signals, to facilitate the problem of initial acquisition by the hoped-for partner. The main dilemmas of SETI are that we don't know at what *frequency* in the radio spectrum to listen, and in what *direction* to point the antenna. Since the transmitting race is faced with the same questions, it may decide to set up continuous transmissions of sufficiently broad bandwidth in all directions of space (isotropic), rather than a narrow-band, highly directional beam.

But such a "simple" omnidirectional beam requires tremendous transmitter power, and only a truly advanced super-civilization may be able to afford the energy expenditure (on the order of 2×10^{22} watts) to transmit over a distance of 1000 LY for *nondirectional* reception. This is about 3 billion times the total current energy consumption of all mankind (about 6.6×10^{12} watts).

Speculations about such ultra-advanced civilizations thought out by brilliant minds have found their way into the scientific literature. The Soviet astrophysicist N.S. Kardashev, for example, has boldly classified hypothetical advanced technological races in the universe into three categories, according to the amount of energy they are capable of harnessing: Type I, at a level close to that of present-day Earth civilization, controlling about 6.7×10^{12} watts (6-7000 gigawatts); Type II, civilizations capable of capturing and using the entire energy output of their central star, assumed to be of the luminosity of our Sun (4×10^{26} watts); and Type III, ultra-civilizations that command the energy of an entire galaxy, some 10^{37} watts.

We should be able to detect the signals of any Type II civilization in our galaxy and those of Type III races anywhere in the universe (even without knowing beforehand where to look), if they use their tremendous power to transmit continuously in all directions. The omnidirectional beacon over distances less than 1000 LY would require much lower power levels, on the order of $10^8 - 10^9$ watts. This would be within the capability of even Type I civilizations, but the need for highly directional receiving antennas, in order to pick up these signals, forces us into a serial search mode, in which one star is examined at a time. Earlier, we have seen that from 120,000 to 330,000 stars (perhaps even more) would have to be investigated within 1000 LY for a 95% chance of success. If we spend 15 minutes with each star, the total search (not counting nonproductive "set-up" and "down" times), will take anywhere from four to ten years.

The second major problem of SETI finding the frequency of the putative signal, can be solved by using multi-channel receivers employing digitally "smart" multi-channel spectrum analyzers that listen to millions of narrow frequency bands at a time. Metaphorically, the classical needle-in-the-haystack dilemma of SETI thus becomes less formidable by having millions of hands to help sift through the hay. And we can try to "second guess" the other civilization's transmitting logic in selecting the most promising "universal" frequency regions.

2. A case could also be made for the opposing view, in which intelligent life is sparse in the universe: If the average lifetime of a technological civilization is much shorter than the assumed ten million years, we are practically alone; if the start-up and evolution of life happened later and slower than assumed, we may be standing in the morning light of the universe among the very first of intelligent races.

3. 1 light year (LY) = 9461 billion kilometers (5913 billion miles) 1 parsec (pc) = 3.26 light-years (30.8 trillion kilometers)

(continued from page 51)

fiction adventure penned by Terry Nation and distributed in the U.S. by Time-Life. *Botanic Man* is a half-hour, ten-episode science show aimed for the fall which will deal with ecology. *Tales Of The Unexpected* is also promised for the fall in the U.K. with actress Patricia Neal acting as a regular host/guide. Thus far, the twenty-six episode series has filmed two dramas: "Man From The South" starring Jose Ferrer and Katy Jurado and "Dip In The Pool" starring Jack Weston. *Tales Of The Unexpected* is based on the work of writer Roald Dahl.

One of the most talked-about British productions on the drawing board is *Sylvia (Space: 1999)* Anderson's proposed *Alpha Man*, a science-fiction adventure to be produced jointly between English and Italian companies. Casting has not yet been completed, but Anderson is looking for an American actor for the lead.

NETWORK PILOTS: Currently in the works for the fall is *Captain America*, the latest Marvel hero to make the jump to the tube via a full-length telefilm pilot. Also nearing production is *Dr. Strange*. On a lighter note, CBS has announced plans for *Danny And*

The Mermaids, a comedy pilot helmed by Ivan (Flipper) Tors. Written by Budd Grossman and directed by Norman Abbott, the show concerns a young man who, during the course of his post-grad studies in oceanography, finds a real live mermaid at the ocean's floor. Featured in the yock-fest are Patrick Collins, Herleigh McBride and Ray Walston, who last advanced the cause of science speculation in video's realm with *My Favorite Martian*. Along the syndication route, a major "what if" series called *The Beta Chronicles* is now being offered to network affiliates. Exploring the world of legend, monsters, mysteries and fact, *Chronicles* includes such episodes as "The Alien Encounters," "The Lost City of Atlantis," and "The Curse Of The Mayan Temple."

COUNT DRACULA: Aired two months back on PBS, The Great Performances presentation of *Count Dracula* is now re-running in parts of the country. The three-part series, adapted from Bram Stoker's classic tale by Gerald Savory, introduces fantasy fans to a myriad of stunning videotape effects and a truly memorable portrayal of the king of the undead by Louis Jourdan. Also featured in the cast are Frank Finlay as stalwart Prof. Van Helsing and Susan Penhaligon as Lucy Westenra, the girl the ghouls love to put the bite on. H

(continued from page 77)

money!) then. Add in the five or ten thousand each car costs you a year, total up the result . . . and move.

Sounds pretty terrible, right?

But let's take a closer look. It might not be terrible at all. In fact, it might be a lot of fun.

* * *

Living in the suburbs is energy-intensive. You have to drive wherever you want to go, and that uses floods of energy. Each little house stands all by itself, with the winds smiting it from all four sides and on top, sucking heat away in the winter and piling it on in the summer; and that uses vast amounts of energy too.

It's not just the suburbs. In their present form, the second point is true of the cities, too. Buckminster Fuller says that if you wanted to design a perfect radiator, to waste as much heat as possible, you would stretch a bunch of long, spindly spikes into the air. And that, he points out, exactly describes the New York City skyline. It also describes the skylines of Boston, Chicago, Los Angeles, London, Tokyo, Paris and just about every other major city in the world, and most of the minor ones; they are all full of skyscrapers, they are all voracious gobblers of energy . . .

What can you do to save the situation? Why, build a dome over the cities, says Fuller. An aluminum-girder and plastic hemisphere a mile or so across would take in the central areas of most cities. And you would save *ninety-five per cent* of the energy needed to heat and cool all of those buildings. 95%! Just by replacing all those individual heat-wasting surfaces with one rounded dome.

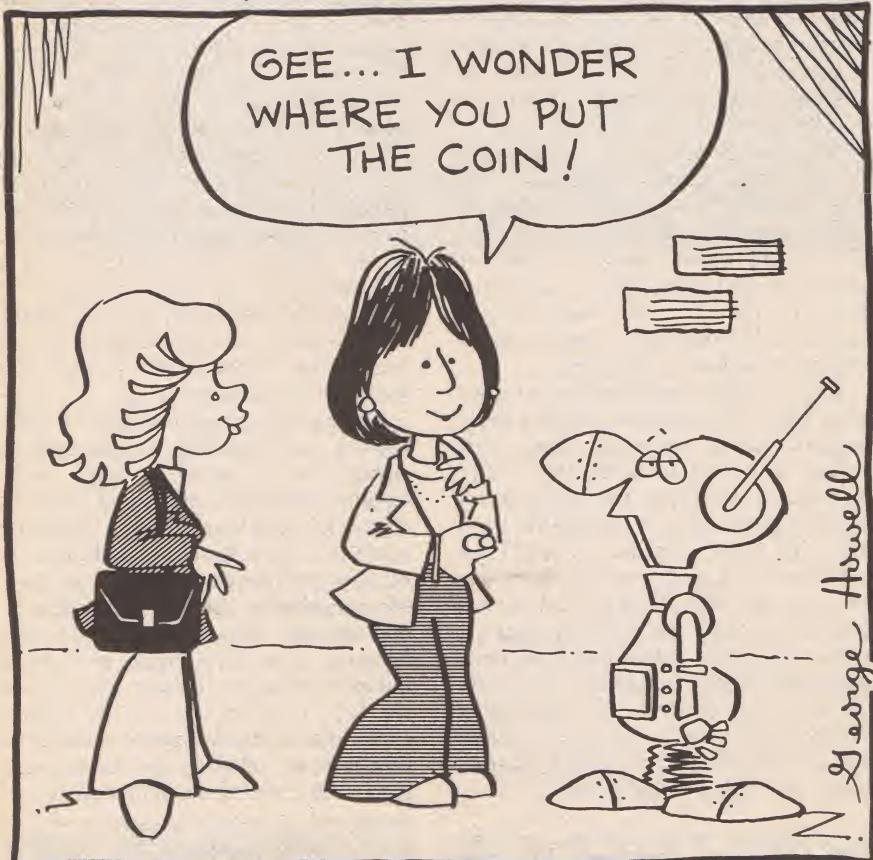
"Golly, who wants to live under a dome!" you say. You'd never see the stars! Or a rainbow, or feel the gentle caress of a spring shower or a summer breeze.

Well, I wouldn't worry too much about that. Even now, most city dwellers live under a dome. Only it isn't made of aluminum and plastic, it's made of smog and atmospheric inversions. When was the last time anyone saw the stars from Wilshire Boulevard or Oxford Street? When you fly into Los Angeles almost anytime you can see the brown discoloration hanging over the city from fifty miles away. I've seen the same discoloration in a hundred other city skies—up in the snow-tipped Rockies, in Denver; out over the broad Pacific, coming into Honolulu. If it isn't quite as bad as Los Angeles in most of the world yet, it's only a question of time—especially if we go on demanding more and more energy, and are thus driven to using dirtier and dirtier fuels. H

Gizmo

By GEORGE HOWELL

GEE... I WONDER
WHERE YOU PUT
THE COIN!



A great thing about living under a Buck Fuller dome is that it is a natural air-conditioner. He built a small one for a fair in Africa once, and the people called it "the cooling machine." As the heat collects inside it, the warmed air rises. You let it out of the top of the dome (maybe putting horizontal wind turbines into the escape vents to turn that rising air into electricity for you), and it draws new air through the bottom. In the process it cools you off.

If it's still too hot for you, you can cover part of the dome with reflecting material, throwing the sun's heat back into space. Better than that. You can lay panels of photovoltaic cells all over the top of the dome. These are the "wings" that you see on space satellites. They convert solar energy directly into electricity. There are things wrong with them. For one, they're expensive. (But the price is coming down, and the prices of other sources of energy are going up; at some time they will be cheaper than competing sources.) For another, they block off sunlight. (But you can lay them in interesting patterns, letting in as much or as little sunlight as you like. You can even angle them so that they intercept more sunlight in the summer, when the sun is highest and you need shade most, and pass more through in the winter, when the sun is low in the sky.)

The other side of the air-conditioning coin is that, in winter, the dome is a great hothouse. I don't mean just that it keeps you from freezing. I mean a hothouse. In a place like New York City, imagine strolling in your shirt-sleeves in January. Swimming in Central Park Lake on New Year's Day. Growing palm trees, orange groves, orchids, hibiscus. It makes sense to have as much greenery around as possible, to keep the air clean and healthful, not to mention smelling and looking nice. Plant creepers in giant-sized window-boxes on the step-backs of skyscrapers, and have the Empire State Building look like a floral centerpiece for midtown Manhattan. Swing vines between the twin towers of the World Trade Center, and then let some amateur Tarzans loop across them if you like. Plow up all the major avenues and plant stately elms and birches to grow all year around. You won't need as many streets for traffic any more, because you won't have cars and trucks. You can't afford to have the pollution of automobile exhausts. And you don't need that much traffic anyway, since commutation no longer exists, with people moving back to the cities. For getting around the city you have the subways, electric trucks and buses—and, yes, maybe even the trolley car makes a comeback. All electrically powered.

Where does the electricity come from? Some comes from the solar cells and wind generators at the top of the

dome. Most comes from giant generating plants located outside the dome. What the generators burn is open to some question—maybe nuclear fuels. Maybe coal. Either way, they are better outside the dome than in. But we have a few tricks up our sleeves for them, too.

One of the great problems of generating plants is getting rid of the waste heat that is left over when the steam has passed through the last low-temperature turbine. We won't waste it. We'll convert it into an asset. Some of it can be piped in to heat the city in the winter. The rest can go to another purpose. Long Island Sound is handy to New York City. If you vent your waste heat from the generators into it, you can keep it warm enough to grow food in all year around: oysters, clams, mussels, finfish, shrimps. If, at the same time, you take the sewage from New York City and settle it, sterilize it, grow algae or single-cell protein in it and dump that in the water, then you provide the fish in the sound with food to grow on. Tired of salt water fish? No problem. If you dam the Sound at Hell Gate and Block Island, over a period of time rain and the rivers flush out the salt and it becomes a freshwater lake a hundred miles long. And if you get tired of piping water in from the Catskill reservoirs, you can drink it.

It has been estimated that, under that sort of regime, Long Island Sound alone can produce enough protein to meet the dietary needs of more than 100,000,000 people. When your gallon of gas went to \$10, the price of chemical fertilizer climbed along with it. So food became more expensive, too. But here is a way to grow it cheaply and in immense volume. And in addition to the above—and perhaps more important than the above—there is the sense of community. Open-air concerts all year round. Soft-ball games in the middle of Times Square. Street fairs and block parties, and no worries about a rain date. —Well, maybe a few worries. A dome the size of a city is so big that it can generate its own weather inside. When it's cold outside, the warm, moist air as it rises will drop out some of its moisture before escaping through the vents. But those are gentle showers, not storms. A sprinkling, not a disaster.

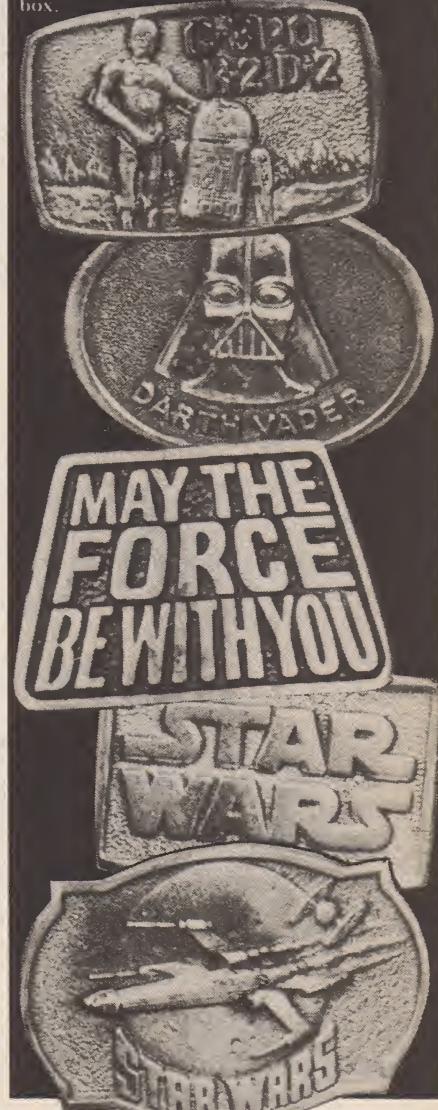
* * *

So that is one possible future scenario. It isn't "the" future. It is a possible future. We can have it if we want it—if we, and our leaders, make the decision to "invent" it. It is exactly as likely as the man-on-the-Moon was before John Kennedy, or the atomic bomb before the United States started the Manhattan Project. If the decisions are taken to make it happen, it will happen. If they aren't, it won't.

But, oh!, I wish it would! Because the alternatives, as I see them, are pretty scary...

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Imagine . . . adding a new dimension to your earthly being by accessorizing your jeans or slacks with Darth Vader or C3PO and R2D2 on the face of a belt buckle. Perhaps you would rather beam your way through the day with the message — May The Force Be With You, or brighten the day with Star Wars. EACH BELT BUCKLE IS MADE OF SOLID BRASS, HAND POLISHED TO A JEWELRY FINISH. The belt buckles make a fantastic gift for any of your galactic friends. Each buckle arrives packaged in a beautiful gift box.



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BORIS

The Fantastic Art of

BORIS VALLEJO



Above: Boris keeps in artistic shape with visits to art classes. This is just one result.

By ED NAHA/RICHARD MEYERS

On one side of the cluttered room, Tarzan the Magnificent stands, muscles rippling, over the body of a dying lion. At his side, the barbarian hero Conan effortlessly drives back a horde of warrior ghouls. Barbarella, the spacey heroine of the future, strikes a hesitant pose, ray-gun in hand while nearby the legendary Loch Ness monster bursts skyward from its watery domain, completely dwarfing a rowboat below.

In the center of this surreal montage sits Boris Vallejo, paintbrush in hand.

Surrounded by paintings, sketches, posters and mounds of scattered art equipment, Boris calmly takes his place before his easel and sketches yet another doorway into the Vallejo world of fantastic reality: a place populated by larger-than-life heroes, too-beautiful-to-be-true damsels in distress and positively hellish monsters. No matter what new scene unfolds on this fresh piece of canvas, it is sure to enrapture the souls of Boris' ever-growing legion of fans . . . which, according to the artist, is exactly how it should be.

"I don't really believe in creating work for the establishment," Boris

muses from within the confines of his tiny studio. "I want to be popular. I want everybody to appreciate my work. That's one reason I enjoy being a science-fiction and fantasy illustrator. I like to reach as many people as possible."

In fantasy art circles, Boris Vallejo is currently being touted as THE artist to watch, destined to join the ranks of such revered illustrators as Frank Frazetta and Kelly Freas in terms of sheer power and popularity. In slightly over ten

Right: *The Best of Leigh Brackett* paperback cover, "The Enchantress of Venus" had Boris himself as one of the models.



BORIS



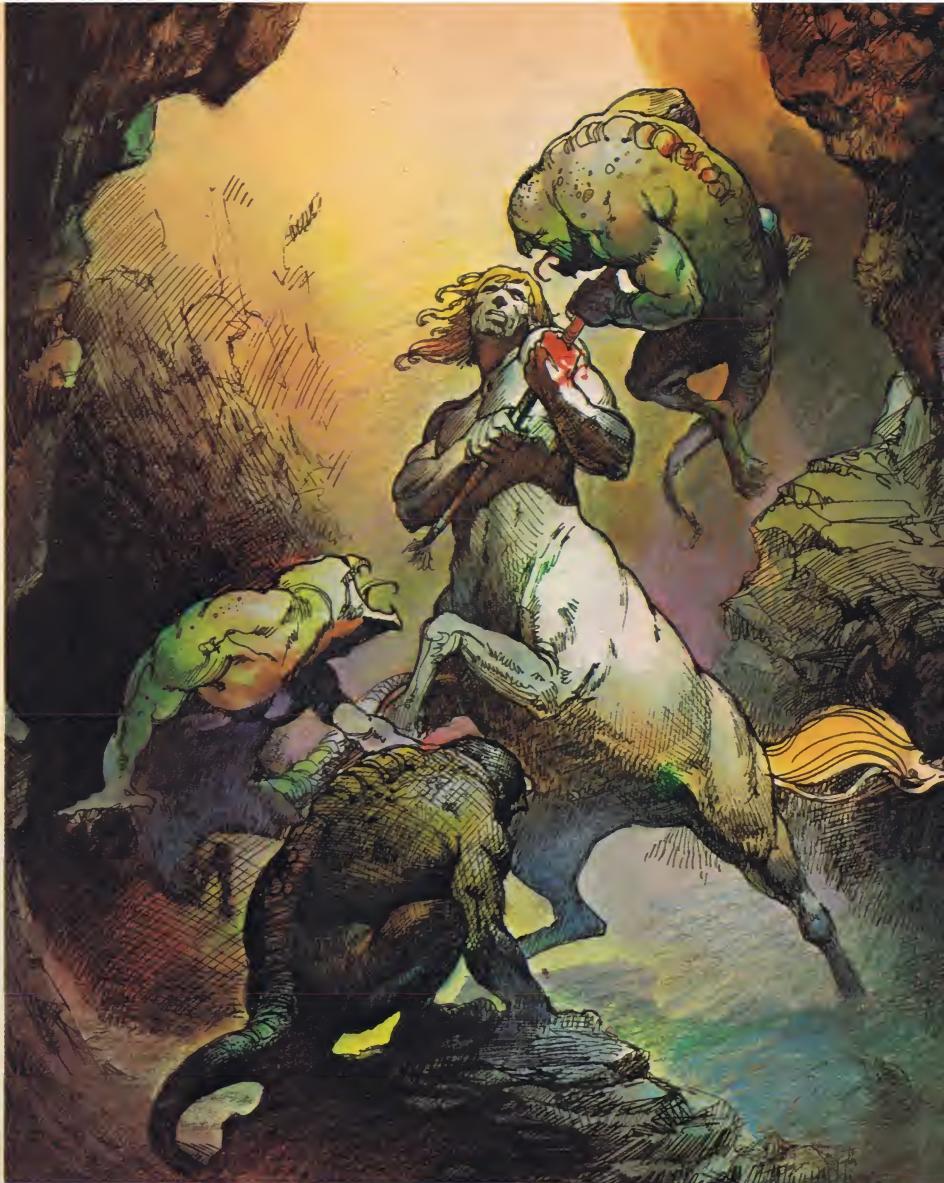
BORIS

Left: "The Black Nubian" is just one of five Boris posters that will be released this summer nationwide.

years, he has taken the magazine and paperback book fields by storm, bringing his own stirring brand of romantic adventure to the tales of Edgar Rice Burroughs, Leigh Brackett, L. Sprague deCamp and Lin Carter. His swash-buckling swordsmen and defiant Amazon queens have totally captured the imagination of fandom at large. His creations display a perfect combination of strength and dignity in all their actions. They are heroes in the traditional sense of the word: risking all for a cause, for a belief.

It is only fitting to discover that Boris' rise to the top was just as awe-inspiring as any feat of derring-do performed by any of his imaginary heroes. His real life experiences read like the never-say-die antics of some of his more popular characters. In this story, however, the hero sports Levis instead of a loincloth and wields a paintbrush instead of a sword. For the well-muscled young artist, the road leading to the realm of fantasy illustration was a long and decidedly uphill one to traverse.

Today, firmly ensconced in his suburban New York home, Boris takes time from his work and recalls his origins. Born in Peru, young Boris was a thin and rather frail boy, whose first brush with fantastic art came mainly by way of daydreaming. "My first real interest in science fiction," he remembers, "was sparked by the paintings of Chesley



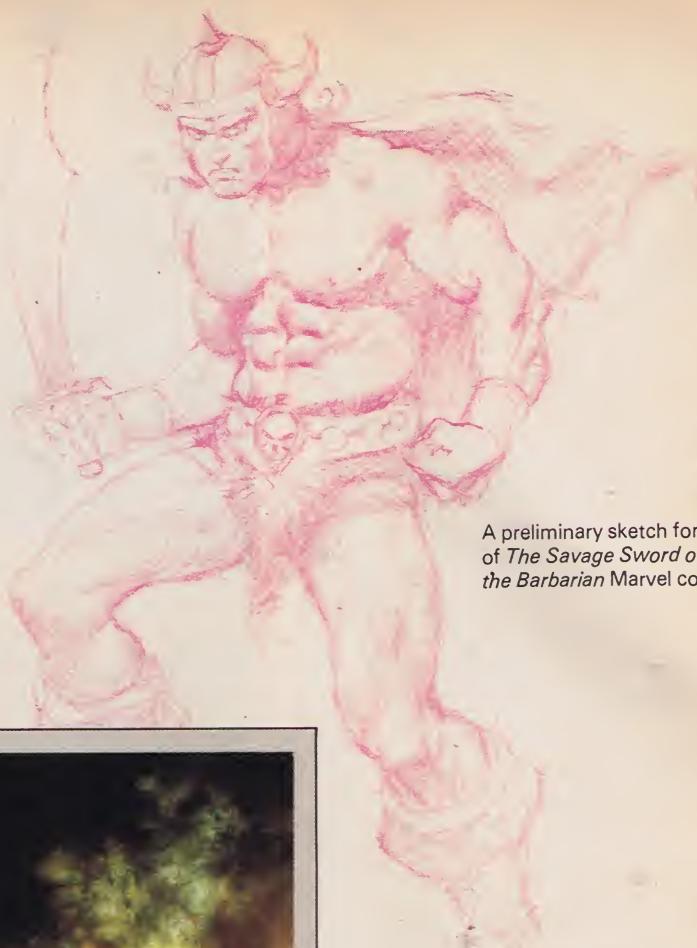
Above: This was Boris' idea for the cover of his art book. Ballantine decided against it.



Left: The color rough for both *The Micronauts* movie poster and book cover. Above: the paperback—if you look carefully you can see that Boris was the model for the man on the left and Doris, his wife, is the girl on the far right.

Bonestell. There was a magazine in South America called *Masaya*, which means 'beyond.' All the paintings were done by Bonestell and I was just fascinated by what I saw. I was about eight years old and I really *believed* in those paintings. They were so accurate, so real, *so there!* It was sheer accident that I came across that magazine, but after that I was *hooked!*"

The youngster attempted to make his spacey daydreams a reality. Dabbling in art, he eventually won a college scholarship while in high school. Despite his latent desire for the world of fantasy illustration, however, the teenager found himself drifting towards a medical career. "I suppose I wanted to be 'Marcus Welby,'" he laughs. "My idea was to help people. It was an extremely romantic idea. But then again, I guess I'm *still* a romantic." But change was in the cards for young Boris. A fascination for the world of body building led him into a three-year program of self-improvement which added sixty-five pounds to his emaciated frame, transforming it



A preliminary sketch for one of *The Savage Sword of Conan the Barbarian* Marvel covers.



THE BORIS CALENDAR

For 1978, Boris created a fantastic series of 12 Tarzan paintings that were reproduced in full-color for a calendar. In most stores, these calendars have already vanished and will not appear again, but FUTURE has secured a limited stock and is offering them to our readers who appreciate the brilliant technique and dramatic visions of Boris. Suitable for framing, the large-format calendar can be thought of as a portfolio of 12 Boris illustrations on quality glossy paper. Order now! These will not last long! Send \$4.95 plus 90c 3rd Class postage for each calendar to: **FUTURE Magazine, Boris Calendar, 475 Park Ave. South, New York, NY 10016.** Include your printed name and mailing address.

from Wally Cox to Steve Reeves proportions. Soon, Boris resembled the prototype for many of his Conan covers.

Vallejo also decided to abandon his floundering attempt at medicine, seeking a full-time career in art instead. His first jobs took him far afield from the fantasy he longed for. Working for advertising agencies, Boris quickly picked up a working knowledge of layout and design. But the closest he came to on-canvas heroics was the portrayal of obviously successful businessmen battling the door handles of their newly purchased sedans. After a few years of mental stagnation, Boris decided he was ripe for a change.

"I decided that if I was going to make a career in art," Boris explains, "that the place to go was the United States. And of all the cities, the best one for me would be New York. Everything was happening in New York. I had seen movies about it and I had this idea that New York would be sort of like Times Square on New Year's Eve—people packed in the streets, pushing each other around."

And so, filled with visions of Oz, the plucky artist began his odyssey. Armed with little more than the courage of his convictions, he bought a one-way ticket stateside. "I had \$80 in my pocket and I didn't speak English," he winces. "I didn't know what I was going to do or



When not working feverishly on paintings, Boris spends his time doing life sketches.

where I was going to go. I just had a great deal of self-confidence. I figured something would happen."

It did. Boris was hired by a Connecticut advertising department affiliated with a large chain of department stores. Soon, both the department and Boris were relocated in New York and Boris was commissioned to draw inspiring portraits of the adventuresome, heroic, lithe and supple forms of . . . refrigerators.

"I couldn't stand it," Boris moans, his eyes growing wide in quiet exasperation. "I was drawing all sorts of little things: pots and pans, furniture, open refrigerators with fifty million things in boxes, vegetables—awful things. And all in this very precise scale. I really hated it."

On the plus side, Boris' encounter with kitchen art eventually brought him closer to a career in fantastic art. "It really gave me a very good basis for detail," he adds on a serious note. "It gave me a very steady hand and a lot of patience and discipline. I think I use that to a great extent now. I often notice certain artists in my field who *almost* make it. They do everything *almost* perfectly. Then, all of a sudden, they seem to get tired and slop off." (Being a diplomat as well as a perfectionist, Boris does not name names.)

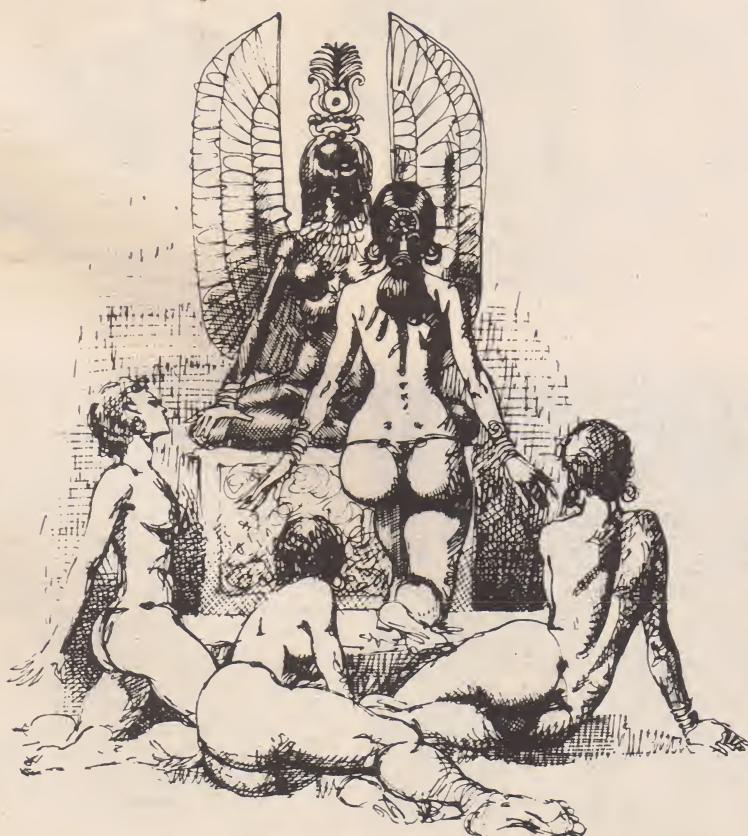
While developing his detail work in the vegetable jungle of household appliances, Boris chanced to meet his wife-to-be, Doris. "People always make comments," Boris laughs good-naturedly. "You know, Boris and

BORIS



THE BORIS BOOK

For Boris fans, collectors and art enthusiasts, FUTURE has arranged for a limited quantity of a beautiful special edition magazine featuring the sketches and paintings of this talented artist. The book includes an interview with Boris, a complete index to his book covers and posters, photos of Boris posing, his family, his studio, many of his original prose-photos, and a superb collection of black-and-white reproductions of his paintings, original pen and ink sketches, book and comic covers, and even some of his early advertising art, greeting cards, etc. With a full-cover cover, glossy paper, 52 pages, 8½" x 11" format, this special book has a very limited press run and will not be mass-distributed to regular bookstores. Order your copy today, directly from FUTURE—only **\$5.00** each, plus postage and packing.



A preliminary sketch for a book cover entitled "Haesel the Slave." Eventually, the sketch will be transformed in a full color painting, suitable for framing.

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For each copy of "Boris" send \$5.00 plus
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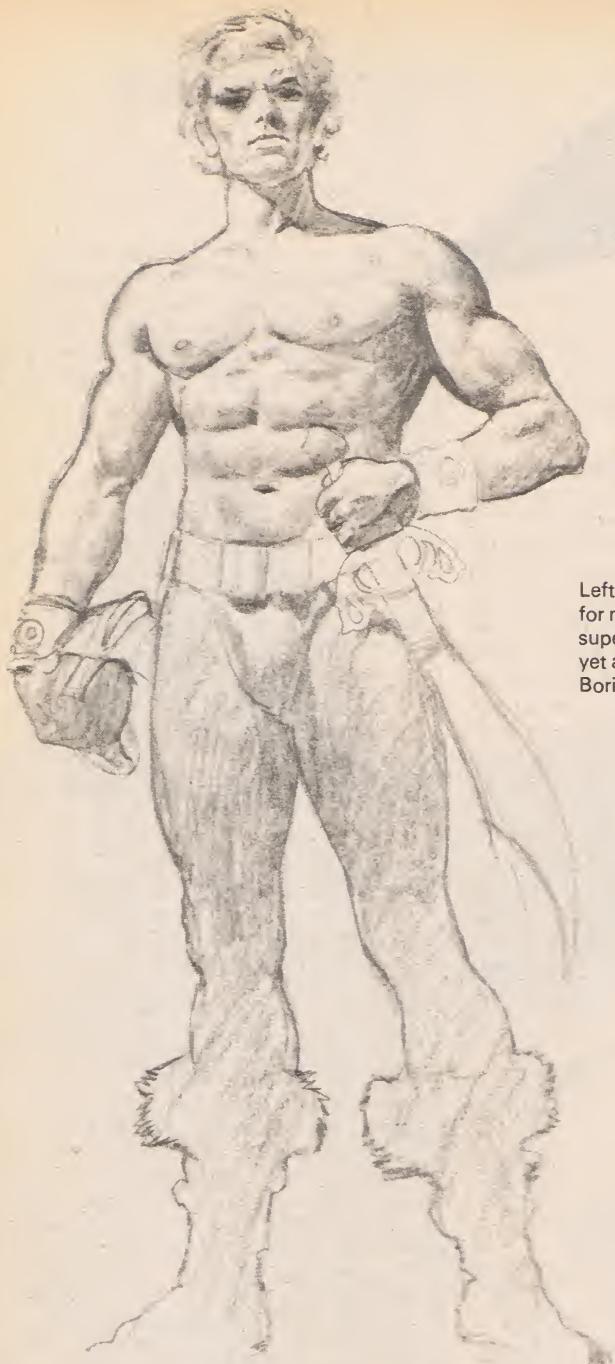
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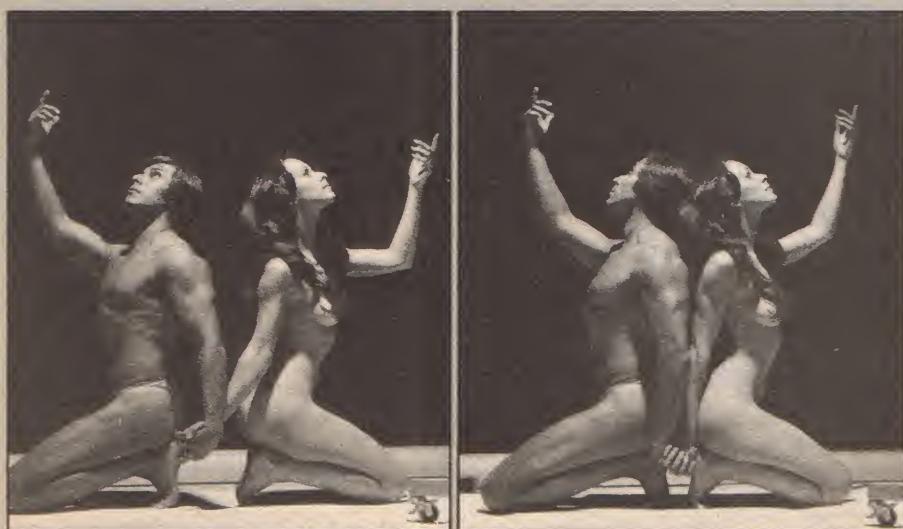
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Left: Boris himself poses for most of his muscular super-hero portraits. Below: yet another glimpse at Boris' life sketches.



Doris. We didn't plan it that way. It just happened." Doris, an artist herself, worked in the same department of the agency. The two married and then were told, much to their amazement, that married couples were not allowed to work for the same company. Doris was fired. At that point, Boris had a few things to say to the company himself, summing up his feelings with a terse "I quit." Much to his employer's chagrin, he began a successful freelancing career in advertising art. One of his most in-demand creations was, horror of horrors, *refrigerators!* Boris' mind boggled at the thought of creating icebox edifices for the rest of his life and he sought a means of escape. "One of those days, when I had something like fifteen or twenty refrigerators, I got so sick of the whole thing that I bought a few paints and canvas."

Suddenly things started falling into place. Childhood memories of comic books and science-fiction pulps began to take hold of his imagination. A painting began to take shape. "I've always liked comics," Boris states. "I actually learned English from American comics. At the time I started this painting, *Creepy* and *Eerie* magazines were the big thing and their style was Frank

CREATING THE COVER

For the original cover painting, Boris himself posed for photos (left) along with one of his favorite models. The session was photographed by Bob Osonitsch, and Boris selected two pictures that contain the exact pose elements he wanted. He combined these elements into tissue pencil drawings (right) and transferred them onto a prepared illustration board. Next, he painted in a brown acrylic wash of the main figures and thoroughly completed the background (far right) before finishing the figures in oils. Boris' technique allows him the control and planning that is his nature—leaving nothing to accident or what some artists call improvisation. He saves the main figures for last so he will know how powerful and bold to make them. The result of his cerebral process is a vision of enormous emotional impact!

Frazetta. I must say that he was really my first influence. If it wasn't for his work, I wouldn't have thought of doing this. So I decided to do a monster with a muscular hero. I was interested in muscles anyway."

Indeed, Boris' first painting in the realm of fantasy pictured the quintessential muscular warrior, battling a hideous, winged, banshee-demon. With his back rippling in a show of sheer brute strength, the warrior lashes out at the creature—the monster's shriek almost audibly bursting forth from the canvas. Boris was rapidly discovering a new outlet for his talent. But his wife and children, Maya and Dorian, were somewhat puzzled by Vallejo's departure from the wonderful world of pots and pans.

"Doris thought I was crazy," Boris chuckles. "'Here you have all this work to do and you're wasting your time with this nonsense,' she told me. But I did the monsters anyway. And when it was finished I thought, 'Hey, this doesn't look half bad.' "

James Warren, the publisher of *Creepy* and *Eerie* agreed, buying the painting and using it as the cover of *Eerie* No. 34. Almost immediately thereafter, Boris was deluged with offers to paint other surreal scenes for such Skywald magazines as *Nightmare* and *Psycho* and Marvel mainstays *Tales of the Zombie*, *Dracula Lives* and *The Savage Sword Of Conan*. As thrilled as Boris was with his newfound calling, he was somewhat cautious about pursuing it. "This was really sort of a sideline," he states. "Kind of a fun thing to do. It wasn't my living by any means. It didn't pay well enough and the assignments came every month or so. But I was enjoying myself and, at the same time, developing a technique."

The Vallejo style slowly began to take form from cover to cover. Surrounded by misty swirls of multi-color, Boris' characters have a startlingly three-dimensional quality. Caught within a wealth of detail and stunning composi-



Boris' preliminary designs are quite detailed. Here, *Rolind of Nerv* takes shape.





Above: a preliminary illustration from one of Boris' numerous western novel covers. Below: a page from the Boris sketch pad.



tion, the artist's creations all seemed to teem with anticipation. His warriors were all pictured poised for action. The paintings seemed to scream with kinetic energy, spotlighting the imminent confrontations. The first Boris paintings pioneered an artistic stance he is proud of to this day.

"You sort of anticipate what is going to happen in many of my pieces," he explains. "I think that when you see the action happening, despite what people may say to the contrary, you *lose* something." He offers a quick example. "You read a book and later on it becomes a movie. The way you picture it in your imagination is much more exciting than seeing it. It happens to me all the time and I'm sure it happens to a lot of people. You see the movie and you say, 'Yes, it was fun but that's not really the way I pictured it. The actor wasn't quite what I had in mind. The action wasn't quite right.' Somehow, the effect is spoiled when you see it right there. That's why I really don't like to put things 'there.' I don't like to paint 'it's happening now.' I like to do 'well, it's



An early Boris cover illustrating the fairly ghoulish goings-on of Zombie life.

going to happen.' And the rest is up to you, really."

Despite the jarring nature of Boris' initial excursions into the realm of sword and sorcery, early fans and art directors alike were able to discern a hypnotic sense of serenity in the midst of the exaggerated action, a sense of calm. As it turns out, in his formative years, Boris flooded his cramped studio with classical music while painting teeth-gnashing scenes, a habit he still continues today. "It soothes me," he says. "I can be doing a painting with blood and corpses flying around and be listening to *St. Matthew's Passion*, which is a very relaxing and mystical work. Music is an abstract feeling for me."

Boris' mesmerizing style began to impress a lot of fans and book publishers but, despite the ever-increasing demand for his talent, the artist was loathe to leave his advertising job; the job offered him a steady income for his family. But, as the 1960s melded into the '70s and the crunch of a national recession was heard through the corporate world, Boris Vallejo found himself living in an advertising age without many clients. Taking this setback as an act of fate, Boris began approaching the powers-that-be at such paperback companies as Ace, Ballantine and Berkley and, before long, his covers became easily recognizable to readers of *Tarzan*, *Conan* and the *Counter-Earth* series.

Watching Boris work in his studio, the familiar shadows of his covers (plastered haphazardly across the walls) seem to play across the artist's face. One gets the feeling that Boris is down there on the canvas with his heroes. And, in essence, that is exactly the case. "There is such a variety in this type of painting," he beams, "that I can really put myself into it." His knowing smile reveals his secret. To meet Boris is to meet his Tar-

zan, his Conan, his Lord Barbarian. It is Boris' face that roars triumphantly on the cover of *Tarzan the Magnificent*. It is his hand that holds the rattlesnake at bay on the cover of *Apache Wells*. It is his body that crouches on the *Best Of Leigh Brackett* volume. Always a stickler for exacting detail, Boris usually works from a photo of a model to get the expression and position he needs. One of the models he uses most consistently is himself.

As well as using professional actors to model for his paintings, Boris will often use the members of his family. And so it is his young son Dorian who bravely pokes a spear at the dragon on the cover of *Conan Of Aquilonia* and his wife Doris who appears in various degrees of defiance and distress on dozens of his hapless-heroine paintings. Fantasy artwork is decidedly a family affair for Boris Vallejo and his family is his greatest influence—although some art critics insist on conjuring up comparisons with Boris' original guru.

"People always compare me with Frank Frazetta," he shrugs. "But I think that people who have seen Frazetta originals and my originals can readily tell the difference. I'm not going to say I'm better than he is, but I'm not saying that he's better than I am, either. I think the subject matter is similar but the styles are different."

Entrenched in the comfortable messi-

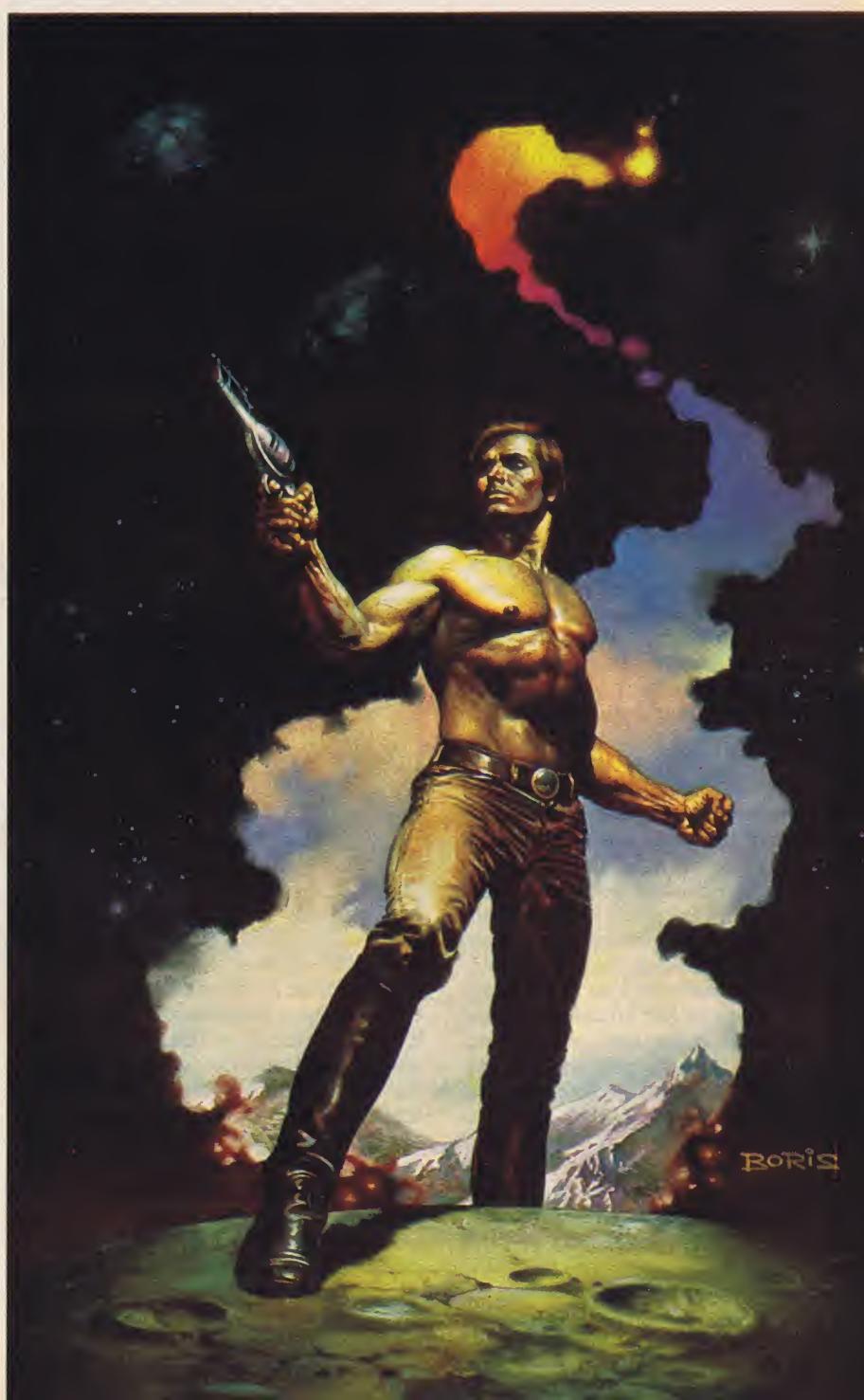
ness of his studio-headquarters, the handsome craftsman shakes his head when asked about his future. "I quite frankly don't have a goal," he says matter-of-factly. "I'm too ambitious to have a goal. Once I achieve something, it is always on to the next step for me. I remember when I first got here, one of the most important things for me to do was to get a job, so I got a job. That was that. Then onto the next step. I wanted to do illustration, to do comic book covers, so I did that. Then I wanted to do paperbacks, so I did that. I have done over 100 covers in the past three years. I'm doing movie posters and I'm waiting for the book. Now that the book is out, I don't know what the next step is. It's going to be something else but I don't know what."

He slouches in the studio's sofa. All around him are the splendid likenesses of his heroic figures. Downstairs, Maya and Dorian chat amiably with Doris. On the easel is his next assignment: a pair of space-age lovers facing the universe together . . . romantically, idealistically, heroically. Boris seems to draw strength from the various worlds of wonder that he creates. He nods happily, envisioning his next great step. "I know I have the skill. I know I'll always have the talent. I believe in myself. I really think that just about anything I attempt to do, if I really want it badly enough, I will do. If I really try as hard as I can, I'm going to do it."

In the world of Boris Vallejo, both on and off the canvas, the good guy always wins.



Above: The color rough of the second of two covers Boris did for *The Dragon and the Gerge*. He posed for the knight himself. Right: *Behind the Gates of Terra*.



I've been asked to talk about the future, and I will, but before I start I'd like to clear something up:

There isn't any such thing as "the" future.

This is important to keep in mind, because most people don't know that. They think of "the" future as some concrete bundle of events. If asked to visualize it, they would probably describe it as big, hairy and menacing, like a disaster waiting to happen. But there are a thousand possible futures, or a million—actually, there is an infinite number of them. As John R. Pierce says, when the future comes there will only be one of it—but then it will be "the" present, not the future anymore.

Does this sound confusing? Don't feel bad if it does. It has confused a lot of pretty smart people over the years. They think that what is going to happen is somehow controlled by natural law—or by divine law—and if you only had a way of figuring out how the laws worked you could find out what was coming up. So they go to astrologers or tea-leaf readers; or if they are Presidents or business executives they go to think tanks. They ask what is going to happen. They seldom get a right answer, because they're not asking the right question. There is not one future; there are many.

If you think about it, you will see that this is so. For instance, what is your future five minutes from now? You have a lot of options. You can go on reading this magazine. You can turn on the TV. You can call up a friend. You can get back to that job you've been putting off. You can give it all up and take a nap. There are probably a hundred different "futures" for you five minutes from now.

Which is "the" future?

The one you decide to have. And what is true for you as an individual is true in exactly the same way for the country and the world.

That is why one of the great men of future studies, Dennis Gabor (who in-

vented the hologram and other fine things as well as pioneering in the study of futurology as a scientific discipline), says, "You can't predict the future. You can only invent it."

* * *

Let's look at an example.

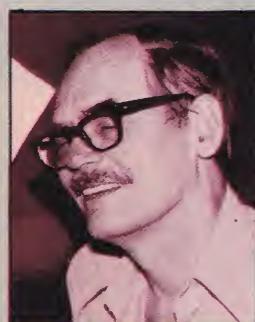
At least fifty years ago, it was clear to a lot of people that the future could include human beings traveling through space to the Moon. I was reading stories about that as early as 1930. I began writing them myself only a few years later. Some of the stories were wild guesses. Others were based on known science. The basic scientific knowledge required goes back to the calculation of the Hohmann orbits, which were published around that time, and to the simple laws of rocketry which were

hard work that would make it happen.

As it turned out, the person who made that decision was President John Fitzgerald Kennedy. He had the muscle to make that sort of a decision, which required diverting a fair chunk of the resources of the United States into making it come true. If Kennedy had not made that decision, the idea of putting a man on the Moon would have remained science fiction indefinitely.

Nor is it simply "big" decisions that shape the future. What the future will be will be determined by millions, even billions, of separate decisions. The people who make them will include Presidents and dictators, business executives and scientists. But they will also include zoning boards and school teachers and, yes, you and me and

How To Invent The Future



Pohl

Four time Hugo Award recipient Fred Pohl is the only person to win the coveted award as both an editor and a writer. The multi-faceted Pohl is a veteran of the golden age of SF pulps and cut his literary teeth alongside such young peers as Isaac Asimov, Damon Knight and Cyril Kornbluth. He has penned such well known science-fiction works as *Man Plus*, *Gateway*, *The Gold At Starbow's End* and *In The Problem Pit*. For an interview with Pohl, see the premiere issue of *FUTURE*.

known to the Chinese centuries before that. Anybody who took the trouble to look into it could see that, with a lot of hard work—but without the necessity for any breakthrough discoveries not already known—it would be possible to send a man to the Moon in the future.

But that's like saying that it would be possible for you to count to 100,000,000 by ones. Sure you could. But you probably never will. In order to make that possibility happen, someone had to decide to put into the project all of the energy and resources and money and

everybody. The decisions at the lowest level—down to the single person who nobody ever heard of—are among the most important. Why is the world's population growing massively? Because a billion couples decided to have more children—or decide not to avoid having them, which comes to the same thing. Why is the world's dolphin population threatened? Because tens of millions of us decide to feed tuna fish to our cats.

On questions like these, the world's leaders can try to make the decisions for us. But they can't always enforce them.



Art: Steve Hoffheimer

Indira Gandhi tried very hard to get the Indians to limit their childbearing. She didn't succeed. The fact that she tried so hard is one of the reasons why she isn't president of India anymore.

So nobody can tell you what "the" future is going to be. Not even science-fiction writers, like me.

We can do something like it, though. We can tell you what may be scientifically and technically possible. We can show you the consequences of things that are happening now—the things they will lead to, if they are continued. We can even point out possible surprises.

We cannot, however, tell you what "the" future will be, because that depends not only on what can be, but on what some person or group decides to make happen.

That may not sound like much. Actually, it's quite a lot!

If you have an idea of what is possible, you can look on it as a sort of Sears, Roebuck catalogue of possible futures. (Science-fiction stories are a good place to look for this catalogue.) Then you pick the future you like, and try to help it along. Or you define the futures you don't like, and look for ways of avoiding them. If you can see the consequences of something that is happening now, you can make up your mind whether you are willing to accept

them. If not, you can try to find a way of stopping what is happening. And that is pretty useful, because it often turns out that the consequences are a lot more complicated and threatening (or hopeful!) than one would think at first look.

* * *

For instance, let's consider the consequences of the price of a gallon of gas.

Right now, it's dirt cheap—less than a dollar. We know, beyond a reasonable doubt, that it isn't going to stay that way forever. We've already skimmed all the really cheap oil in the world. From now on we have to dig a little deeper and work a little harder. Get it from expensive and dangerous places like the North Sea and the Alaskan North Slope, convert it from coal, boil it out of shale rock, go back to played-out fields and scrape out the leavings at the bottom of the pot. All of that costs. There will be oil for a long time, but it won't be cheap, ever again.

So let's look a decade or two into the future, to where gasoline costs ten dollars a gallon instead of one. I don't know when that will be exactly, but I know for sure that it is coming. Let's see what the consequences of that price hike may be.

For openers, private cars become just about prohibitively expensive.

If you put ten thousand miles a year

on your car, that means you will have to pay \$100 a week for gas. (We're talking about 1978 dollars by the way, not whatever funny-money the process of inflation brings us in another few years.) You will also be spending a lot more to buy the car in the first place. The manufacture of even a compact car uses something like 40,000 kilowatt-hours of energy. At a tenfold increase in energy costs, that adds \$1500 or more to the cost of making a car for you to drive. For the first time in generations, it will become materially cheaper to travel by public transportation. Cheaper still not to travel at all. The suburbs will no longer be cheaper to live in than the city, for equivalent housing. People will want to live closer to where they work. And to where they play, too. Schools, shops, churches, theaters will die on the vine unless they are within walking or easy public transportation distance from the people who go to them.

At the same time, all the other energy-related costs will, of course, go up at the same rate as the gas you put in your car. Chemical fertilizers will go up by the same factor of ten, because they are fossil-fuel consumers. So does the cost of heating your house, or air-conditioning it. If you've been spending \$1500 a year on those bills in 1978, you'll be spending \$15,000 (in real

(Continued on page 64)

PLANT OF THE FUTURE

Science has invented an easy, new way of growing plants. Your plant began as a minuscule section, or explant, of tissue that was surgically removed from a mature plant. This tiny explant was then exposed to rich nutrients in a scientifically controlled, sterile environment called tissue culture. While in the culture (a gelatinous product made from seaweed), the explant develops cell clusters that eventually grow into a full-sized plant which is an identical copy of the original parent.

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—perspectives—

Being as intensely involved with the emerging shape of the future as we are, it is sometimes difficult to see the work within the broader, societal context. Often we are impatient and frustrated with the pace of development and what we perceive as a lack of insight of the part of governmental institutions. The failure to follow up the Mars/Viking landers with a robot-rover mission is one frustrating example. The recently announced cutbacks in the size and scope of the infant Space Shuttle fleet

are more scientists alive and working today than in all of the previous ages of mankind combined. (Keep in mind that societies have not always held science and its practitioners in great esteem—Copernicus was ultimately burned at the stake for discovering the proper relationship of the Earth to the Sun.)

Societal attitudes have changed. The fact that the present administration may lack the vision to lead us into space is not necessarily critical. What is important is that the society as a whole has



Proposed Martian Robot-Rovers. Photo: NASA.

and the lack of establishing a national priority for harnessing the clean, inexhaustible energy of the Sun with solar power satellites are also causes for concern within the futurist community.

However, taking all of this into account, there are still many reasons for optimism.

The first and clearest positive sign is the scope of ongoing scientific research and development. From MIT to Cal Tech, the finest minds in the country are involved in discussing and designing the alternate shapes of the future—from new food and energy sources to the elimination of aging and disease. There

turned toward embracing the future and anticipating with growing excitement the day when space travel, exploitation and exploration will have become a reality.

And if you're not sure about that just look at the latest—and most revealing—social trend. Science fiction movies such as *Star Wars* and *Close Encounters* are in the process of rewriting box office history and the *Star Trek* movie, *Superman* et. al. are coming soon. The floodgates have opened . . . there will be no turning back. So hang in there and have faith—we are about to embark on the greatest journey of all.

—Howard Zimmerman/Editor

FUTURE #4

The next issue of *FUTURE* will present Ben Bova's vision of a "skyjacking" in space, along with a fascinating visit with Logan's Run author William Nolan. But that's just the tip of the iceberg: Future Shocker Alvin Toffler updates his incredibly perceptive extrapolations in an exclusive interview and, in a brief trip back to the recent past, we will profile the original Mercury 7 astronauts, asking "Where are they now?" Then too: The High Frontierspeople—The LS Society—make an appearance; a new *Martian Chronicles* production; a new *Civilization in Space* chapter; *Galactica* spaceships; lots and lots of full-color art, new discoveries and inventions, and—naturally—one or two surprises.

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